Trends in Fisheries Research
An International Peer-Reviewed Journal
UGC Approved Journal No: 63495 www.sciencejournal.in

TO STUDY POLLUTION STRESS EFFECT OF INDUSTRIAL WASTE ON BIOCHEMICAL PARAMETERS IN *PARREYSIA FAVIDENS*

[1]Kakulte V.R. and [2]Babare M.G.
[1]Department of Zoology, K.T.H.M.Arts, Commerce and Science College, Nashik, (M.S.), India.
[2]Department of Zoology, Arts, Science and Commerce College Naldurg,
District: Osmanabad, (M.S.), India.

ABSTRACT
Biomolecules are the important and rich source of energy for all the organisms required for various metabolic processes of in the body. The carbohydrate is the fundamental biomolecule that provides energy for metabolic processes. It is also the important component of the structural material of living organisms. Proteins are present in all the tissue as it is a major building block of the body of an animal. Lipids play their role as major storage of energy in the body and also acts as the insulator to the body. The pollution stress on bivalve disturbs their biological function in the body. In the present investigation glycogen, protein and lipid content was estimated. In the treated group glycogen, protein and lipid content was found to be decreased at the significant level in the foot, mantle, gill, and hepatopancreas as compare to control group of animal.

KEYWORDS: Biomolecule, gill, hepatopancreas, mantle, pollution.

INTRODUCTION

The freshwater bivalves *Parreysia favidens* are the commercially important animal as it is used as food. Very little work has been done to observe the toxicity of the industrial effluents to these animals. Thus the present investigations have been made to estimate the contents of glycogen, protein, and lipids in the foot, mantle, gill, and hepatopancreas of the bivalve. The dysfunction in damage tissue may result in the quantitative alteration in enzyme activities. Thus enzyme bioassay can provide diagnostic mean to access damage or injury caused to organism due to exposure to heavy metals. Therefore by measuring the activity of some key enzymes, it is possible to determine the physiological effect of the toxicants on the biological systems.

The carbohydrates are the fundamental biomolecule present in the body of the living organisms. It is the main source of energy for the metabolic activities. Proteins are the most abundant macromolecule that constitutes over half of the dry weight of most organisms. Proteins are the organic compound, which made up of carbon, hydrogen, oxygen, and nitrogen. It plays an important role in biological processes it acts as a catalyst and restores the genetic information. Proteins are the polymers of amino acids, which play a vital role in maintaining the intracellular osmotic balance during physiological stress condition. The content of Phytase improves the nutrient digestibility and fish growth performance fed on the plant in *Labeo rohita* fingerlings (Baruah et al., 2007a). They demonstrated significant improvement in growth performance in *Labeo rohita* fingerlings when they fed plant-based diets supplemented with microbial phytase. (Baruah *et al.*, 2007b). Lipids are the rich source of energy. It also acts as the insulator. The lipids work in association with other components in the physiological function of the animal body.

Pollution stress alters the total biochemical makeup of the body of the bivalve. The literature review shows that the pollution stress due to pesticides as well as various heavy metals on aquatic animals was studied very intensely. The metabolic responses of the freshwater animal to various toxic substances were studied by many workers. Ramanarao and Ramammurthi (1978) studied the effect of sublethal concentration of sumithion on biochemical composition of snail, *Pila globosa*. Salanki *et al.* (1982), Nagbhushanam *et.al.* (1987), Rao *et.al.* (1987), Chaudhari (1988), Mule and Lomte *et.al.* (1995) and Lomte and Deshmukh *et.al.* (1996), studied the effects of pollutants on freshwater animals for their toxic action on biochemical composition. Erande, (1998), Chaudhari (1999) studied the effects of various pesticides on biochemical alteration in various groups of the aquatic ecosystem.

The pollution stress by different heavy metals followed by altering biochemical composition was studied by Varma and Tonk (1983), Deshmukh and Lomte (1998), and Chaudhari (1999). All of them reported significant variations in biochemical contents of the tissues of freshwater bivalves. According to Barton and Iwama, (1991); the utilization of

glycogen is the only energy precursor that can be used anaerobically during the stress. Chapekar, (1991) reported that the depletion of glycogen in the body as physiological adaptation and the adapted organisms capable of whistling stressors at the expense of more energy, develop the necessary potential to counteract the stress by modifying its biochemical composition. The toxicological details with histopathological and biochemical changes in fishes have been made by Admerk *et al.*, (1977), and Haniffa and Sunderavardhan (1984).

In the present study, an attempt is made to analyze the biochemical changes in organ/tissue of bivalve, *Parreysia favidens* exposed to sublethal concentration of industrial effluent.

MATERIALS AND METHODS

Glycogen was estimated by anthrone reagent method (Dezwaan and Zandee, 1972). The total protein content was estimated by using Lowry's method (Lowry, et al.,1951) and the content of lipids can be estimated by vanillin reagent using cholesterol as standard as given by Barnes and Blackstock (1973).

RESULTS AND DISCUSSION

In the biochemical analysis, the glycogen content ~~in~~ in the foot, mantle, gill, and hepatopancreas of treated bivalve was 29.47, 35.52, 32.66 and 42.63 % mg/100 mg respectively. While in the control bivalve it was found to be 27.73, 34.34, 28.08 and 39.48 % mg/100 mg in the foot, mantle, gill, and hepatopancreas respectively (Table 1).

The Protein content in treated bivalve in the foot, mantle, gill, and hepatopancreas was 63.47, 32.66, 58.69 and 63.36 % mg/100 mg respectively while in the control bivalve it was found 59.25 in foot, 28.57 in the mantle, 52.66 in gill and 62.89 % mg/100 mg in hepatopancreas.

Table 1. Shows the Glycogen, protein and lipd content in body organs of bivalve, *Parreysia favidens* exposed to sublethal concentration of industrial effluent.

Body organs	Test	Glycogen Content	Protein Content	Lipid Content
Foot	Control	29.47 ± 0.06	63.47 ± 0.43	5.97 ± 0.25
	Treatment	27.73 ± 0.93	59.25 ± 0.67	5.76 ± 0.46
Mantle	Control	35.52 ± 0.32	32.66 ± 0.44	6.58 ± 0.35
	Treatment	34.34 ± 0.48	28.57 ± 0.22	5.84 ± 0.13
Gill	Control	32.66 ± 0.44	58.69 ± 0.96	6.47 ± 0.20
	Treatment	28.08 ± 0.19	52.66 ± 0.63	5.51 ± 0.23
Hepatopancreas	Control	42.63 ± 0.39	63.36 ± 0.49	5.59 ± 0.20
	Treatment	39.48 ± 0.38	62.89 ± 0.58	4.45 ± 0.31

All values expressed in %mg/100mg in dry weight of the tissue.
± indicates S.D.

The Lipid content in treated bivalve in the foot, mantle, gill, and hepatopancreas was 5.97, 6.58, 6.47 and 5.59 % mg/100 mg respectively while in the control bivalve it was found 5.76, 5.84, 5.51 and 4.45 % mg/100 mg.

The present investigation, the glycogen, protein and lipid content in the treated group was found to be decreased at the significant level in the foot, mantle, gill, and hepatopancreas as compare to control group of animal. The changes in biochemical parameters such as carbohydrates, proteins, and lipids are important to indicate the susceptibility of organ systems to pollutants by altering their function as indicated by Varma and Tonk (1983). The present investigation shows biochemical changes due to sublethal concentration of industrial effluent in total glycogen, protein and lipid content in target organs and tissues significantly. Similar observations have been made in fishes exposed to distillery effluent (Periyasamy, 1999). The sudden decline shows that these are utilized in the glycogenesis to compensate the energy demand under effluent stress.

The protein content in experimental tissue showed gradual decrease indicating proteolytic activity in tissue/organs or gluconeogenesis in order to meet the energy demand under the effect of industrial effluent stress in *Perreysia favidens*. Our observation is supported by the work of Varma and Tonk(1983) who found a decrease in protein

content in kidney, exposed to malathion. Somnath (1991) observed a decrease in biochemical contents like proteins, carbohydrates, and lipid in *Labeo rohita* exposed to tannic acid at acute and subacute level.
Glycogen is the immediate source of energy which gets converted into glucose by glycogenolysis to overcome the stress by pollutants. In the Present investigation, there is a sudden depletion of glycogen content in the foot, mantle, gill, and hepatopancreas in early exposure to cope up with the stress. Similar results were seen in the liver of juvenile Coho salmon and muscle glycogen profile of H. fossils, exposed to paper mill effluent Me Leay (1979).

Our results are in accordance with Rao *et al.,* (1985), according to their study decrease in the lipid content may be attributed to its utilization in order to meet additional energy requirement induced due to effluent stress. Also the decrease in the lipids may be because of the inhibition of lipid synthesis or also due to mobilization of the stored lipids by the process of β oxidation (Jha, 1991). Thus from the present study it can be concluded that the altered contents of the glycogen, protein and lipids may be due to their consumption in order to cope with stress induced by the effluents.

REFERENCES

Admerk R., Limirch, D., Verma J. and Tirilova B. (1977). Preliminary test of the influence of waste water from sugar factories on number of intestinal bacteria in water. *Mcd.* 146 : 340-351
Barnes H. and Blackstock J. (1973). Estimation of lipids in marine animals and tissue,detailed investigation of the sulpho-phosphovanillin method for"total'lipids. *J. Exp. Mar. Biol. Ecol.* 12:103-118.
Barton B.A. and Iwama G.K. (1991). Physiological changes in fish from stress in aquacualture with emphasis on response and effect of corticosteroids. *Annual Rev. Fish. Dis.* 3-26.
Baruah, K., Pal K.A.K., Narottam P.S.and Debnath D. (2007a). Microbial phytase supplementation in *Labeo rohita*, diets enhances growth performance and nutrients digestiblity. *J. World Aquat. Soc.* 38: 129-137.
Baurah, K., Sahu N.P., Pal A.K., Jain K.K., Debnath D. and Mukharji S.C. (2007b). Dietary microbial phytase and citric acid synergistically enhances digestibility and growth performance of *Labeo rohita* (Hamilton)juvenile at sub- optimal protein level. *Aquat. Res.* 38:109-120.
Chapekar,S.B.91991): An overview on the bioindicators. *J. Environ. Biol.* 163-168.
Choudhari, R.T.(1999): Some physiological activities of the fresh water bivalves, *Parreysia cylindricus* associated with heavy metal stress. Ph.D. Thesis, B.A.M. University, Aurangabad.
Choudhari, T.R.(1988) : Pesticidal impact on some physiological aspects of *Bellamya bengalensis*. Ph.D. Thesis, Marathwada University, Aurangabad.
Deshmukh M.S. and Lomte V.S. (1998):Impact of copper sulphate on lipid metabolism of the freshwater bivalve, *Parreysia corrugate*. *J. Ecotoxicol. Environ. Monit.* 8(1):65-69.
Dezwaan A. and Zandee, D.I.(1972): The utilization of glycogen and accumulation of some intermdediates during anaerobiosis in Mytilus. J. Comp. Biochem. Physio.,43:47-54.
Erande, S.L.(1998): Study of toxic effect of some pesticides on *Viviparous bengalensis* from Darna river in district Nashik. M.S. Ph.D. Thesis, Marathawada University, Aurangabad.
Haniffa, M.A. and Sunderavardhan, S. :1984 : Effect of distillery effluent on histopathological changes in certain tissues of *Barbus stigma*. *J. Environ. Biol.* 5(1) : 57-60.
Jha, B. S. (1991). Alteration in the protein and lipid content of intestine, liver and gonads in the lead exposed freshwater fish *Channa punctatus* (Bloch). *J. Environ. Ecoplan.* 2(3): 281-284.
Lowry O.H., Rosenberg N.J., Farr A.L. and Randall R.J. (1951). *J. Biol. Chem.* 193.
Me leay D.J. (1979). Effect of a 12 hrs and 25 day exposure to Kraft palp mill effluent on blood and tissue of Juvenile, *Coho salmon*. J. Fish. Res. Board. Can,30(3): 396-400.
Mule M.B. and Lomte V.S. (1995). Copper sulphate induced alteration of protein in fresh water gastropod, *Thiara tuberculata*.*J. Ecobiol.* 7(3): 177-180
Nagbhushnam, R.,Deshpande,J.R. and Sarojini, R. (1987): Effect of some pesticides on biochemical constituents of fresh water prawn, *Macrobrachium kistnensis*. Proc. Nat. Symp. Ecotoxicol.,PP 773-784. Marathwada University, Aurangabad.
Paul Raj S. (1982). Studies of the effect of paper factroy effluent on the hydrography of the river Vauvery and its toxicity to common carp *Cyprinus carpio* Var.Communis(Linneay). Ph.D. Thesis:Tamilnadu Agric. University, Coimbatore.
Periyasamy M. (1999). Impact of sugar and distillery effluent on length- weight relationship and biochemical constituents of the fish, *Catla catla*. M.Sc. Dissertation , University of Madras.

Ramanarao M.V. and Ramamurthi R. (1978). Effect of sublethal of sumithion on some biochemical -:constituents of freshwater snail, *Pila globosa*, *Geobios.* 7:247-250.
Rao K. S. P., K.R.S. Rao., I.K.A. Sahib and K.V.R. Rao (1985). Combined action of carbaryl and phenthoate on tissue lipid derivative of muscle of *Channa punctatus* (Bloch). *Ecotoxicol. Environ. Saf.* 9(1): 107- 111.
Salanki J., Bilogh V.K. and Berta E. (1982). Heavy metal in animals of lake Belathion. *Water Res.* 16: 1147-1152.
Somnath Beena (1991). Effect of acute sublethal concentration of tannic acid on the protein, carbohydrate and lipid levels into tissue of fish *Labeo rohita*. *J. Environ. Biol.* 12(2): 107-112.
Varma S.R. and Dalela R.C. (1975). Studies on pollution of the Kali nadi by industrial waste. Mansurpur. Part 2, Biochemical characteristics of the river. Avista, Hyderabad, 3:259-274.
Varma S.R. and Tonk T.P. (1983). Effect of sublethal concentration of mercury on composition of liver, muscle and ovary of *Natoplerus natoperus*. *Water, Air and Soil Pollution.* 20 : 287-292.

