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IMPACT OF DETERGENT TIDE ON THE BIOCHEMICAL PARAMETERS OF THE FRESH WATER FISH, *LABEO ROHITA*

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ABSTRACT

Water pollution occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds. One of the main sources of chemical pollutants is everyday detergents. Specific contaminants leading to water pollution include a wide range of chemicals (such as bleach) and microbes. Several chemicals that we use in our daily life are harmful elements and compounds. These could be magnesium or calcium-based substances that affect water. Detergents sometimes could be carcinogenic, so they should be eliminated from the water. According to Enviroharvest Inc., "The detergents can contain suspected carcinogens and ingredients that do not fully biodegrade." When detergents affect lakes and ponds, the phosphates present in them act as fertilizers and cause the rapid growth of algae, which can lead to the death of other organisms in the water. LC_{50} value of Tide for *Labeorohita*at 24, 48, 72 and 96hrs were calculated. The amount of protein, carbohydrate and lipid content in *Labeorohita*exposed to detergent (Tide) decreased in all experimental groups when compared to control.

KEYWORDS: Detergent Tide, *Labeorohita*, biochemical.

INTRODUCTION

A pollutant has been defined as “any solid, liquid or gaseous substance present in such concentration as may be or tend to be injurious to environment”. Industries and agricultures are the two arms of nation’s economy and health. However in recent years these two arms are infected with evil called "Pollution" (Reddy, 2002). Various principle pollutants which pollute our air, water, land or deposits matter, metals, agrochemicals, compels organic substances, photo chemicals, oxidants solids wasters and detergents. It has become essential to provide farmers and crofters and those involved in activities such as agriculture contractors and companies involved in spreading organic measures to land, with practical guidance on how to prevent pollution.

Water pollution has become a serious problem throughout the world it is unfortunate that the rivers are being increasingly used as natural dustbin for discharge of all sorts of community and industrial wastes (Aravind kumar, 1995). Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers and groundwater). Acute toxicity data can help identify the mode of toxic action of a substance and may provide information on doses associated with target-organ toxicity and lethality that can be used in setting dose levels for repeated dose studies. This information may also be extrapolated for use in the diagnosis and treatment of toxic reactions in humans. The results from acute toxicity tests can provide information for comparison of toxicity and dose-response among members of chemical classes and help in the selection of candidate materials for further work (Hedayati*et al*., 2010a).

Detergents affect the liver of aquatic organisms indirectly through absorption of certain tissue, as liver acts as detoxicant of any toxic substances enters the body (Yatim, 1990). It was mentioned further that the first liver damage found was congestion, i.e. the increase of the blood volume in the blood capillaries. The failure of oxygen intake by the fish and liver damage result in the growth retardation (Himawan, 1998).Detergents also effect on biochemical aspects of the animals and also change the concentration of proteins, fats and carbohydrates (Najam *et al*.,2010). The interaction between detergents and proteins, and their influence on membrane permeability may be the basis of the biological action of detergents.

Fishes are very good biosensors of aquatic contaminants and as bio-indicator species respond with great sensitivity to changes in the aquatic environment. Scanning of pertinent literature reveals that detergent related works on fish are still very meager and limited to acute toxicity determination (Adewoyeand Fawole, 2005; Ogundiran*et al*., 2010). Reports pertaining to detergent induced biochemical changes in Indian freshwater fishes are very scanty (Kamble and Tapale, 2011) despite the fact that toxic influences in any living tissue are first exerted at biochemical level and therefore, biochemical markers are the earliest indicators of toxic potential of any xenobiotics. Biochemical studies on fish tissues have drawn the attention of several researchers because tissues are major source of protein, carbohydrate and lipid and have high calorific value.

MATERIALS AND METHODS

Rohu is a eurythermal species and does not thrive at temperatures below 14 °C. It is a fast growing species and attains about 35-45 cm total length and 700-800 g in one year under normal culture conditions. Appropriate narrow range of concentration 10-50 mg was used to find the median lethal concentration using a minimum of 10 fishes for each concentration and the mortality was recorded for every 24 hours up to 96 hours. It was found as 27mgfor 96 hours, using Probit Analysis method (Finney 1971). Four groups of fishes were exposed to 2.7mg (1/10thof 96hours LC_{50} value) concentration of the detergent 'Tide' for 24, 48, 72, and 96 hours respectively. Another group was maintained as control. For each experimental study tissue samples were collected from the fish for the analysis of biochemical parameters like protein, carbohydrate and lipid.

RESULTS AND DISCUSSION

Total Protein Content

Proteins are important biomolecules involved in a wide spectrum of cellular functions. They are one of the most important and complete group of biological materials comprising the nitrogen constituents of the body and performing different biological functions. Environment stress invokes compensatory metabolic changes in the organs of an animal through modification of the quality and quantity of protein.

The gill of the fishes exposed to 2.70 mg detergent for 24, 48, 72 and 96 hours was found to contain 1.70 mg/g, 1.63 mg/g, 1.54 mg/g and 1.20 mg/g of protein. The fishes maintained as control were found to contain a mean of 1.78 mg/g. Liver tissue was found to contain 1.85 mg/g, 1.73 mg/g, 1.68 mg/g and 1.55 mg/g of protein in 24, 48, 72 and 96 hours exposures in 2.70 mg concentration of detergent. The mean protein content in the liver of the control was 2.10 mg/g.1.11 mg/g, 0.91mg/g, 0.80mg/g and 0.67 mg/g of protein were found in the kidney tissue of 24, 48, 72 and 96 hours treated fishes. The mean control value was 1.51 mg/g. The mean protein content in the muscle of the control fish was 2.31 mg/g. The amount of protein in the fishes exposed to 24, 48, 72 and 96hours in 2.7 mg detergent (Tide) were 1.90 mg/g, 1.48 mg/g, 1.10 mg/g and 0.75 mg/g of protein respectively.

The gradual decrease of protein from various days of exposure may be due the influence of exogenous factors like toxic environment, Sapna Srivastava*et al.* (2004) reported that the decreased level of protein, globulin and serum enzyme activity in vaccinated *Tilapia nilotica* exposed to sub lethal concentration detergent. The decreased trend of the protein content in most of the tissues may be due to metabolic utilization of the ketoacids to gluconeogenesis pathway for the synthesis of glucose (Veeriah,2013).

Total carbohydrates content

Carbohydrates which supply the major portion of the metabolities for the energy requirements in a normal individual is oxidized for the energy requisites. Carbohydrates may be converted to glycogen or shunted in the metabolic pathway to supply the carbon chain for amino acids or converted in to fat.

The carbohydrate content in the gill tissues of fishes exposed to short term exposure periods in terms of 24, 48, 72 and 96 hours were 12.88 mg/g, 11.50 mg/g, 11.00 mg/g and 10.70 mg/g respectively. The mean control value was 13.20mg/g. Liver tissue was found to contain 18.00mg/g, 17.70mg/g, 17.21mg/g and 16.55 mg/g of carbohydrate in short term exposure periods 24, 48, 72 and 96 hours. The mean control value was 18.50 mg/g. Kidney recorded 17.33 mg/g in the control fishes. The fishes exposed for short term periods were found to contain16.50 mg/g, 16.00 mg/g, 14.23 mg/g and 12.56 mg/g of carbohydrates. The amount of carbohydrate in the muscle tissue were 14.34 mg/g, 12.72 mg/g, 11.50 mg/g and 10.20 mg/g in the fishes exposed to 2.70 mg detergent after 24, 48, 72 and 96 hours exposure periods. The control fishes were found tocontain 15.77 mg/g of carbohydrates in their muscles.

The low values of carbohydrates recorded in the present study could be due to the fact that glycogen, in many marine animals, does not contribute much to the reserves in the body (Jayasree*et al.*, 1994).A greater decrease of carbohydrate content indicates greater utilization of carbohydrate to cope with enhanced metabolism under stressful situations. Despite a continuous and rapid release of glucose by glycogenolysis in the liver, to meet the energy requirement for the increased muscular activity, a fall in the overall of carbohydrate content in fishes subjected to pesticidal treatment is imminent.

Total lipid content

Lipids have been recognized as essential components in human and animal nutrition and are used as feed additives in aquaculture. Lipids are an important component of diet, both as energy and essential fatty acids sources, which fish need for basic functions, including growth, reproductive and maintenance of healthy tissues (Sargent *et al.*, 1989).

The amount of lipid in gill tissue contain 20.00 mg/g, 19.82 mg/g, 19.6 mg/g and 19.44 mg/g in the fishes exposed to short term exposure of detergent (Tide) after 24, 48, 72 and 96 hours respectively. The mean control value was 20.50 mg/g, 13.45 mg/g, 12.82 mg/g, 11.00 mg/g and 10.75 mg/g of lipid were present in the liver tissue respectively after 24, 48, 72 and 96 hours of short term exposures of the fishes. The mean control value was 13.72 mg/g. Kidney recorded 16.12 mg/g, 15.80 mg/g, 15.11 mg/g and 14.2 mg/g were present in the liver tissues respectively after 24, 48, 72 and 96 hours of short term exposure of the fishes. The mean control value was 16.22 mg/g. The muscle lipid levels in the fishes that were subjected to short term exposure of detergent (Tide) were 18.21 mg/g, 17.35 mg/g, 16.58 mg/g and 16.25 mg/g respectively. The mean control value is 18.60 mg/g. The lipid levels also decreased in the tissues of the fish exposed to the sub-lethal concentration of toxicant. The detergent affects the rate of gluconeogenesis, as a result the lipid level was decreased. The depletion of lipid content may be due to increased utilization of lipid to meet additional energy requirements under a stress of low oxygen taken up (Kulkarni*et al*.,1998). Effect of detergent on the lipid content was reported by earlier investigators (Levesque*et al*.,2002).

Table 1: Levels of protein in different tissues of the fish, *Labeorohita* on exposed to the detergent Tide

Sample (mg/g wet tissue)	Exposure periods				
	Control	**24 hours**	**48 hours**	**72 hours**	**96 hours**
Gill % change	1.78±0.04	1.70±0.02 4.49↓	1.63±0.03 8.42↓	1.54±0.01 13.48↓	1.20±0.05 32.58↓
Liver % change	2.10±0.02	1.85±0.05 11.90↓	1.73±0.03 17.61↓	1.68±0.01 20.00↓	1.55±0.04 26.19↓
Kidney % change	1.51±0.02	1.11±0.03 26.49↓	0.91±0.05 39.73↓	0.80±0.04 47.01↓	0.67±0.01 55.62↓
Muscle % change	2.31±0.06	1.90±0.04 17.74↓	1.48±0.01 35.93↓	1.10±0.02 52.38↓	0.75±0.03 67.53↓

Values are mean ± SD, n=5, Figures in parenthesis are percentage decrease over control.

**= Significant at one percent level *= Significant at five percent level, NS = Non Significant.

Table 2: Levels of carbohydrate in different tissues of the fish, *Labeorohita* on exposed to the detergent Tide.

Sample (mg/g wet tissue)	Exposure periods				
	Control	24 hours	48 hours	72 hours	96 hours
Gill % change	13.20±0.10	12.88±0.05 2.42↓	11.50±0.05 12.87↓	11.00±1.10 16.66↓	10.70±0.02 18.93↓
Liver % change	18.50±0.60	18.00±0.90 2.70↓	17.70±0.05 4.32↓	17.21±0.04 6.97↓	16.55±0.70 10.54↓
Kidney % change	17.33±1.35	16.50±0.17 4.78↓	16.00±1.25 7.67↓	14.23±1.07 17.88↓	12.56±0.26 27.52↓
Muscle % change	15.77±0.35	14.34±0.48 9.06↓	12.72±0.02 19.34↓	11.5±0.60 27.07↓	10.20±0.08 35.32↓

Values are mean ± SD, n=5, Figures in parenthesis are percentage decrease over control.

** = Significant at one percent level, *= Significant at five percent level, NS = Non Significant.

Table 3: Levels of lipid in different tissues of the fish *Labeorohita* on exposed to the detergent Tide

Sample (mg/g wet tissue)	Exposure periods				
	Control	24 hours	48 hours	72 hours	96 hours
Gill % change	20.50±2.08	20.00±2.10 2.43↓	19.82±0.36 3.31↓	19.60±0.68 4.39↓	19.44±0.40 5.17↓
Liver % change	13.72±0.17	13.45±0.70 1.96↓	12.82±0.02 6.55↓	11.00±0.23 19.82↓	10.75±0.49 21.64↓
Kidney % change	16.22±0.96	16.12±0.07 0.61↓	15.80±0.32 2.58↓	15.11±0.91 6.84↓	14.20±0.76 12.45↓
Muscle % change	18.60±0.38	18.21±0.84 2.09↓	17.35±0.63 6.72↓	16.58±0.54 10.86↓	16.25±0.62 12.63↓

Values are mean ± SD, n=5, Figures in parenthesis are percentage decrease over control.

** = Significant at one percent level,*= Significant at five percent level, NS = Non Significant.

CONCLUSION

The present investigation is to understand the effect of Tide, detergent on biochemical parameters such as protein, carbohydrate and lipid of the freshwater fish, *Labeorohita*. A declining trend was observed in protein, carbohydrate and lipid contents of gill, liver, kidney and muscle of *Labeorohita* exposed to short term exposure periods of detergent Tide, as compared to the control. The result showed at all duration. With the various concentrations of detergents fishes shows various types of behavioural changes, like slow swimming movement, bleeding through the gills. Hemorrhage occurs at the base of body appendages (fins) and along the belly. There occurs loss of nervous control, fishes along lateral side of body. Body was slimy due to mucus secretion from epithelium of gills. Even at the low concentration fishes are died due bleeding through gills with both detergent powders. This becomes important in the light of the fact that the fishes forms staple diet and has commercial value.

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