



Effect Of Detergent (Tide) on Glycogen Alteration in Freshwater Gastropod *Bellamya Bengalensis* (Lamarck)

KEYWORDS

Bellamya bengalensis, TIDE detergent, Carbohydrate, Glycogen changes

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ABSTRACT In the present study has been an attempt has been made to study the effect of detergent (Tide) on glycogen content of different tissues like foot, mantle and digestive gland of a freshwater gastropod *Bellamya bengalensis* (Lamarck). The snails were exposed to sub lethal concentration of detergent for 96 hours. The significant decrease in glycogen content was observed in all tissues as compared to control. The maximum decrease was observed in digestive gland followed by mantle and foot. The disturbance in the glycogen profile is one of the outstanding biochemical lesions due to the action of detergent (Tide). The significance of these studies is bio indicator for assessing the toxicity.

INTRODUCTION

During the past few decades, rising trends of population explosion, development of modern technology, industrialization and dramatic increase in the production and consumption of large variety of new synthetic chemicals and there by high amount of pollutants released into aquatic environment. Higher concentrations of toxicant in aquatic environment cause adverse effect on aquatic organisms at cellular or molecular level and ultimately it leads to disorder in biochemical composition. Gastropods are among the best test organisms in ecotoxicological investigations when assessing the effect of pollutants in an aquatic environment (Lam *et al.*, 1997). There is scarcity of information about the alteration of biochemical constituents in gastropods in relation to sub-lethal exposure to detergents. The effect of detergent (Tide) on biochemical constituents were studied in a freshwater gastropod, *Bellamya bengalensis*. Carbohydrates serve as fuel and constitute a major source of energy in the animal. The energy metabolism of many gastropods is carbohydrate based (Emerson, 1967).

The carbohydrate is largely stored as glycogen especially in digestive gland, foot and mantle and available from blood as glucose. Decrease in the carbohydrate content during detergent exposure is observed in *Bellamya bengalensis*. Several workers have reported the impact of various aquatic pollutants on carbohydrate metabolism of different aquatic organisms. Chetty and Indira (1995) observed the adaptive changes in the glucose metabolism of foot tissue in a bivalve to ambient ammonia stress. Kharat *et al.* (2009) reported the glycogen profiles in hepatopancreas of freshwater prawn, *Macrobrachium kistnensis* exposed to lethal concentration of tributyltin chloride. Jinyong Zhu *et al.* (2011) investigated the ultrastructural alterations and biochemical responses in the hepatopancreas of the freshwater snail *Bellamya aeruginosa* exposed to toxic cyanobacterium. Satyaparameshwar *et al.*, (2006) reported the decreased carbohydrate level in the mantle of freshwater mussel, *Lamellidens marginalis* exposed to copper sulphate.

MATERIAL AND METHODS

The snails *Bellamya bengalensis* collected from river Godavari. The snails were exposed to sub lethal doses of toxicants for 96 hrs. The snails control and treated foot, mantle and digestive gland were taken, dried with filter paper and transferred to the hot air oven maintained at 90-100°C. The samples were dried for 3 to 4 days. The dried material was powdered and used for analysis. Total carbohydrates were estimated by using the Anthrone method of Carroll *et al.* (1956). 20mg of sample was homogenized in 5ml of 10% trichloroacetic acid (TCA) and centrifuged at 3000 rpm for 15 min. 1 ml of supernatant was taken for the estimation of

total carbohydrates. To this supernatant 4ml of anthrone reagent was added and vortexed for proper mixing. Then the samples were incubated in the boiling water bath for about 15 min and cooled to room temperature. The colour developed was read in a spectrophotometer at 620 nm against the blank. The amount of carbohydrates present was calculated and the values represented as % of dry weight of the sample.

RESULTS

The changes in biochemical composition of foot, mantle and digestive gland of freshwater gastropod, *Bellamya bengalensis* exposed to acute concentrations of detergent (Tide) was studied along with control animals. The data was supported by various statistical analysis and the standard deviation and standard error of the mean were calculated. Student 't' test was used to find out significance. The level of significance was used in the present study ($P < 0.05$, $P < 0.01$, $P < 0.001$). The change in carbohydrate level in foot, mantle and digestive gland of *B. bengalensis* after exposure to Tide for 96 hrs are represented in the Table 1 and Figure 1. Carbohydrates showed a significant decrease after 96 hrs in all target organs. The maximum depletion of glycogen is observed in the digestive gland and is noted minimum in mantle. The percentage of decrease is 17.89 in foot, 12.32 in mantle and 20.22 in digestive gland on sub lethal exposure for 96 hrs.

These results indicate that the decrease in biochemical constituents together with a reduced metabolism in *B. bengalensis* exposed to detergent (Tide) might be due to more utilization of these constituents under stress from detergent contamination. The most remarkable effect of detergent on the digestive gland was a significant decrease in total carbohydrates content. Total carbohydrates in mantle tissue were significantly lower when compared to control snails after a period of 96 hrs of exposure to detergent. Total carbohydrates were decreased in foot tissues after 96 hrs of exposure.

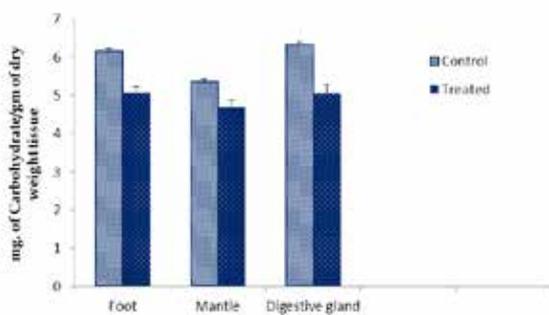
Table – 1: Total Carbohydrate content in the Foot, Mantle and Digestive gland of *B. bengalensis* exposed to Detergent (Tide)

(Mean \pm S.D; n = 3)

	96 hrs. Control	96 hrs. Treated	% variation
Foot	6.164 \pm 0.0642	5.061 \pm 0.165*	-17.89
Mantle	5.349 \pm 0.071	4.69 \pm 0.205*	-12.32
Digestive gland	6.328 \pm 0.093	5.048 \pm 0.235*	-20.22

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$ NS Not significant

Fig. 1: Changes in carbohydrate level in foot, mantle and digestive gland of *B. bengalensis* after exposure to Tide for 96 hrs



DISCUSSION

The biochemical changes occurring in the body gives important indication of stress. During stress an organism needs sufficient energy which is supplied from reserve materials *i.e.* carbohydrate, protein, lipid *etc.* If stress is mild, the stored glycogen is used as a source of energy. Higher concentrations of toxicant in aquatic environment cause adverse effect on aquatic organism at cellular or molecular level and ultimately it leads to disorder in biochemical composition. Literature is not available on the toxicity of detergents on molluscs which directly effects the biochemical constituents. Hence the present study was undertaken to evaluate the impact of detergent on carbohydrate content in different tissues of freshwater snail, *Bellamy bengalensis*.

Biochemical observations revealed the decrease of glycogen level in the liver of *Rana cyanophlyctis* exposed to detergent 'Rin' (Bala Jagannadha Rao and Kishore, 2007). In the present study, significant decrease was observed in the carbohydrate content of the digestive gland when compared to foot and mantle in snail, *B. bengalensis* treated with the tested chemicals. This finding is in accordance with Triebksorn *et al.* (1996) who reported that the digestive gland cells of *Deroceras reticulatum* exposed to various chemical stressors such as molluscicides or other environmental pollutants showed reduction in their glycogen storage. Low levels of glycogen have been detected in the digestive gland of *Littorina littorea* exposed to sub-lethal concentrations of cadmium (Gil *et al.*, 1989).

Padmaja and Balaparameswara Rao (1994) suggested that the depletion of glycogen content in tissues of the freshwater snail, *Bellamy dissimilis* exposed to endosulfan, methyl parathion, quinalphos and nuvan may be due to direct utilization of glycogen for energy generation, a demand caused by pesticide induced hypoxia. The highest depletion of carbohydrates observed in hepatopancreas compared to foot and mantle in *Bellamy bengalensis* and this is due to high utilization of carbohydrate to overcome toxic stress effect caused by lead (Kamble and Nanaware, 2009). There is lack of formation available on the toxicity of detergent compounds on the biochemical constituents in freshwater molluscs, particularly gastropods, and it could be concluded that the biochemical alterations in the tissues of freshwater gastropod, *Bellamy bengalensis* caused by detergent reflected toxicity. The release of detergent compounds in aquatic environment especially in freshwater ecosystem could be controlled.

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