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Changes in the lipid content of Bivalve mollusks *Lamellidens marginalis* after Acute toxicity of cadmium in summer.

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Abstract: Cadmium (Cd) is an environmental toxic metal implicated in lipid abnormalities. Toxicity of cadmium on some metabolic processes can lead to disturbances and imbalance of various physiological activities. The present study reflects the effect of cadmium chloride on lipid in some vital organs of the fresh water Bivalve mollusks *Lamellidens marginalis*. The bivalve were treated with different concentrations of cadmium chloride, mortality rate was noted up to 96 h. The lipids were estimated to study the stress caused by the cadmium chloride as a toxicant. The results showed a significant decline in the total lipids in different. The significant role of cadmium chloride in some vital organs of the experimental animal is discussed and the results correlated and corroborated with the findings of the earlier researchers.

Keywords: *Lamellidens marginalis*, Cadmium chloride, lipid content, Toxicity

Introduction:

Most information about the environmental pollutants on aquatic animals has been obtained from mortality studies. The heavy metals are a serious threat to aquatic environment, particularly the invertebrate species because of their toxicity and tendency to accumulate in such delicate organisms, which lead to increased effects due to bio magnification in the food chain,(Ali and Naaz 2013. Ali 2014. Mahajan 2014 and Sangeetha *et al*.. 2015).

Often very little is known about disturbed physiological and biochemical processes within an organism following exposure to environmental poisons. To better understand potential harmfulness of various pollutants, the biochemical assessment after exposure to pollutants of different nature plays an important role. The lipid metabolite is an important constituent of animal tissue, which plays a prime role in energy metabolism.

Lipids are also important in cellular membranes. Long before, Shigmastus and Takeshita, (1959) observed that after glycogen lipids were used as an energy source. Lipids are used as energy reservoir and these are stored and transported in the form of glycerol and esters. Naga-bhushnam and Kulkarni (1981) studied the lipid levels in the prawn, *Macrobrachium kistnensis* when exposed to thiodan and fenthioate.

Verma and Tank, (1983) studied the effect of pollutants on the tissue of fish *Notopterus notopterus*. Rao *et al.*, (1987) studied biochemical composition in respect to pH and fluoride in the bivalve *Indonaia caeruleus*. Present work was designed to study the lipid content from different body parts of *Lamellidens marginalis* after acute exposure to cadmium chloride.

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Heavy metals are recognized as a strong biotoxicants, because of their persistent nature and cumulative action to the aquatic flora and fauna (Sharma and Agrawal, 2005). Phospholipids, also called structural lipids, are playing an important role in the cell membranes formation (Zambare, 1991; Waykar, 2004; Martinez-Pita *et al.*, 2011).
Shaikh, (2011) has also studied the lipid alterations in various animals after exposure to toxicants.

MATERIAL AND METHODS:
After collection of the animals from habitat, they were immediately transported to the laboratory. The fouling and mud on shell valves were removed without disturbing the siphonal regions. The equal sized animals (90-100 mm shell length) were grouped and kept in sufficient quantity of water (animal/liter) in aquaria with aeration for 24 hrs to adjust the animals in laboratory conditions (with renewal of water at interval of 12 to 13 hrs). No food was given during acclimation time and during experiments. After 24 hrs, 05 groups of animals of almost equal size (90-100 mm shell length) were formed and each group with 10 animals including control group and exposed to different test concentrations of cadmium for static bioassay tests. The stock solution of cadmium was prepared by was made dissolving appropriate quantity of cadmium chloride ($CdCl_2$ $2½H_2O$ AR Grade CDH Bombay) in double distilled water. The pH of the water is brought between 6.9 and 7.1 by adding 1N HCl (due to insolubility of cadmium in reservoir water having 7.6 to 8.1).

RESULTS AND DISCUSSION:
In control group the content showed highest value from gonad (9.042 ± 0.122) followed by hepatopancreas (4.357 ± 0.301), foot (2.914 ± 0.093), gill (2.573 - 0.153), siphon (1.588 t 0.195), posterior adductor muscle (1.528 ± 0.195), anterior adductor muscle (1.448 ± 0.159) and mantle (1.266 ± 0.061). Mantle, siphon, anterior adductor muscle and posterior adductor muscle showed almost equal amount of content. In LC0 group content showed increased from gonad (8.398 ±0.245) followed by gill (4.256 ± 0.129), hepatopancreas (3.897 + 0.272), foot (2.933 ± 1.08), mantle (2.814 ± 0.184), siphon (2.39+0.121), anterior adductor muscle (1.866 ± 0.2 19) and posterior adductor muscle (1.715 ± 0.735). Mantle and hepatopancreas, siphon and foot, anterior adductor muscle and posterior adductor muscle showed almost equal amount of content.
In LC50 group content showed highest value from gonad (15.45 + 3.068) followed by hepatopancreas (9.321 + 0.592), gill (8.608 ±1.942), foot (3.477 ± 0.195), siphon (2.371 ± 0.484), posterior adductor muscle (2.230 + 0.061), anterior adductor muscle (1.969 ± 0.229) and mantle (1.647 ± 0.172). Mantle and anterior adductor muscle siphon and posterior adductor muscle showed almost equal amount of content.
In LC0 group when compared to control group significantly increase from mantle (122.28 % P < 0.01), followed by gill (65.42 % P< 0.01) and siphon (50.5 % P<0.01), anterior adductor muscle and foot (28.86, 12.24 and 0.653 showed no significant respectively) and decreased from gonad (7.13 % P<0.05) and hepatopancreas (10.56%) showed no significant change.
In LCs0 group compared with control group showed highest significancy from gill (234.56 % P<0.01) followed by hepatopancreas (1 13.94 % P<0.01), gonad (70.87 % 6 P< 0.05), posterior adductor muscle (45.95 % P < 0.01), anterior adductor muscle (36.08 % P <0.05), mantle (30. 10, % P<0.05), foot (19.33 % P < 0.05) and siphon.(49.31%) showed non significant increased from hepatopancreas (139. 19 % P < 0.01) followed by gill (102.26 % P<0.05), gonad (83.98 % P < 0.05), mantle (41.48 % P < 0.01) and posterior adductor muscle, foot and anterior adductor muscle (30.03, 18.55 and 5.52 %) showed non significant respectively and decreased from siphon (0.796 %) non significant.

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Fat depots are important source of energy. Lipid metabolisms play an important role under stress condition. In the present experiments lipid content in all tissues of *Lamellidens marginalis* was observed during acute exposure of cadmium chloride. An increase is lipid contents is attributed to the inhibition of energy activity of lipid metabolism after heavy metal treatment.

Coley and Johnson (1973) also described the inhibition of lipase activity after organophosphate exposure. Gangshettiwar (1986) noted an increase is lipid level is the prawn, *M. Lamerrii* after exposure to phenol. Jaiswal (1986) also observed a rise in the lipid content during exposure to lethal and sub-lethal concentration of naphthalene.

According to Rao and Ramamurthi, (1982) the increase in activity of enzyme lipase is for increasing lipolytic activity to meet the increased demand of energy during stress. The lipid alterations in various animals after exposüre to toxicants have been studied by many workers, (Coley and Jenson, 1973; Bhagyalakshmi, 1981; Patil 1986 and Chaudhari 1988).

Rao, (1979) stated that considerable decrease in total lipids in tissue might be due to drastic decrease in glycogen content in the same tissue which is an immediate source of energy during toxic stress condition. After glycogen, lipid content may be used for energy production to over come toxic stress.

Some workers support the results in which lipid con- tent decreases in animals after pollutant exposure. Copuzzi and Lancaster, (1981) reported significant decrease in lipids of post larval lobsters when exposed to pollutants. Kulkarni *et al.*, (1984) have also studiẹd the effect of pollutants on lipid content of the organs of leech *Hirudi biramnica* and demonstrated decreased lipid content.

Lipids play an important role in energy metabolism after glycogen lipids are used as energy source (Shigmatus and Takeshita, 1959). Swami *et al.*, (1983) suggested a shift in carbohydrate and protein metabolism to lipid synthesis in *Lamellidens marginalis* exposed to flodit and metacid.

The increase in lipid content of digestive gland after toxic stress in the bivalve, *Lamellidens marginalis* can be explained on the basis of observations made by Coley and Jensen, (1973).

Values are expressed as mg/100mg dry weight of tissues. ± indicates standard deviation of three independent replications. + or – indicates % variation over control.

Table: Changes in the lipid content from different body parts of *Lammelidens marginalis* after exposure to acute toxicity tests of cadmium in summer season

Biochemical constituents	**Control**	**Lc_0**	**Lc_{50}**
Mantle	1.266 ±0.061	2.814 ±0.184 (122.28%) ***	1.647 ±0.172 (30.10%) * (41.48%) ^{oo}
Gill	2.573 ±0.153	4.256 ±0.129 (65.42%) ***	8.608 ±1.942 (234.56%) ** (102.26%) ^{o}
Gonad	9.042 ±0.122	8.398 ±0.245 (7.13%)*	15.45 ±3.068 (70.87%) * (83.98%)

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Hepatopancreas	4.375 ±0.381	3.897 ±0.272 (10.56%)	9.321 ±0.592 (113.98%) *** (139.19%) ººº
Siphon	1.588 ±0.195	2.39 ±0.212 (50.51%) **	2.371 ±0.484 (49.31%) (0.796%)
Foot	2.914 ±0.093	2.933 ±1.08 (0.653%)	3.477 ±0.195 (19.33%) * (18.55%)
Anterior Adductor muscle	1.448 ±0.159	1.866 ±0.219 (28.86%)	1.969 ±0.229 (36.08%) * (5.52%)
Posterior Adductor muscle	1.528 ±0.195	1.715 ±0.735 (12.24%)	2.230 ±0.061 (45.95%) ** (30.03%)

(Bracket values shows percentage difference) (*, o, P<0.05, **, oo P<0.01, ***,ooo P<0.001, *, compared to control group. 0-compared to Lc_{50} group)

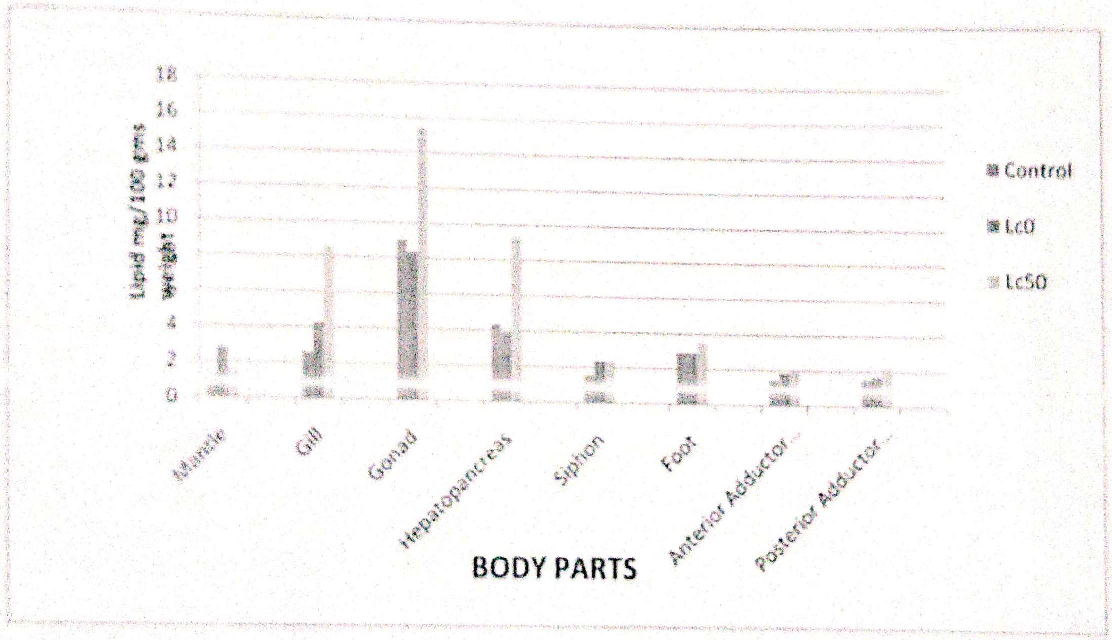

Fig: Changes in the lipid content from different body parts of *Lamellidens marginalis* after exposure to acute toxicity Tests of cadmium in summer season

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