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EFFECT OF LAMDA-CHYLOTHRIN ON GILL AND DIGESTIVE GLAND OF FRESHWATER MUSSEL *LAMELLIDENS MARGINALIS*

Poonam Ahire*, Pramila Bhamre and Ashok Desai[@]
Zoology Research centre, P.G. Department of Zoolgy, K.T.H.M. College, Nashik- 422 002, Maharashtra, India
***(**E-mail: patilpoonam84@gmail.com)
[@](Corresponding author: Ashok Desai E-mail: desaia32@yahoo.co.in)

ABSTRACT
The bivalve *Lamellidens marginalis* was exposed to 123.02 ppm as LC_{50} value of Lamda- Cyhalothrin for 96 hr and histopathological changes were observed in architecture of gill along with digestive gland. Histopathological examination revealed the following changes in gill epithelium like pycnotic nuclei of epithelial cells and necrosis of connective tissue, reduction in intrallamilar space. The lumen of digestive gland cells was shrunken, necrotic cell and atrophy in connective tissue of digestive gland. The changes induced in gill and digestive gland by Lamda – Chyalothrin toxicity are extremely essential from histopathological point of view.

KEYWORDS: digestive gland, gill, Lamda- Cyhalothrin, *Lamellidens marginalis*, mussel.

INTRODUCTION

The freshwater tanks, lakes, dams and rivers are overburden by various discharges from anthropogenic activities resulting in habitat destruction and degradation of fresh water resources. The green revolution draw attention to meet the demand of food in increasing population. Many different agrochemicals viz, fertilizers, pesticides, fungicides, insecticides and weedicides are in common use. These chemicals as outcome of drain and rain water runoff from agricultural land to water bodies lead to high concentration of deterioration of aquatic biota. If this trend continued, large quantityofchemicals pollute drinking water and affect freshwater flora and fauna (Shashikant1990).Pesticide influence the freshwater ecosystem and contaminate different compartments of the ecosystem (Lindgaard-Jorgensen and Bender ;1994). Pesticide at high concentration affect survival, growth and reproduction of fishes *Anabas testudineus*, *Channapunctatus*, *Barbodesgonionotus*, *Naga* and *Glossogobicus giuris* (Rahman, *et al*., 2002; Mckim *et al*., 1975). The pathological and biochemical disturbance in aquatic animals due to pesticide toxicity is documented (Muley and Mane., 1990). These disturbances may be structural, functional at cellular and subcellular levels in organisms (Rodriquez *et al*.,1994). Organic pesticides, chlorinated hydrocarbon pesticides, carbamate and pyrethroids are commonly used. Pyrethroids are synthetic analogue of natural pyrethrins. This compound includes Lamda-Cyhalothrin and its trade name is Tag command. (Sandhya rani *et al*., 2012) observed histopathological changes due tomalathion toxicity on gill of freshwater fish (HAM) *Glossogobicus giuris.*

Toxicity of organoposphosphorous pesticides for different species varies with age, weight and sexof animals (Gill *et al.*,1988; kumar and Ansari; 1984). Histological changes indicates the water pollution and provide useful information on nature and intensity of damage to cells and tissue (Shaikh;2010) reported histological changes, that is ruptured gill lamellae in *Oreochromi smossambicus* caused by cadmium toxicity. Shanta Satyanarayan *et al.*, (2012) noticed histolopathogical changes of gill in fresh water fish *Cyprinus carpio* after exposure to acute and subacute toxicity of dieldrin, DDT aldrin and BHC for prolonged period (20-30 days).The digestive gland of molluscs was targeted organ for poisonous effects for the reason that it plays an important role in contaminant uptake, intracellular food digestion and metabolism of inorganic as well as organic chemicals in the organism (Rainbow and Philips,1993;Marigoez,*et al*., 2002; Usheva, *et al.*, 2006). *Lamilliden marginalis* is economically important freshwater mussel not only used as bio indicator of water pollution but also as biomarker for animal health assessment.

The present studies was carried out to evaluate the toxicity of lamda- cyhalothrin along with histopathological changes in structure of gill and digestive gland in fresh water mussel *L. marginalis* .

MATERIALS AND METHODS

Bioassay: Fresh water bivalve *L. marginalis* were collected from the Darnariver, chehadi (Lattitude$19^0$55’54.02"N,Logitude $73^0$55’30.42"E) Nashik Road, Maharashtra. broughtto laboratory , cleaned to remove their mud and acclimatized in dechlorinated water for 3-4 days in plastic troughs and feed on crushed algae

The water in trough were changed every day. The healthy bivalve of same size and weight irrespective of their sex were selected for the toxicity studies. The pesticide λ-cyhalothrin (5% EC) were locally purchased from Mankar and son' s agro-pesticide shop, Panchavati , Nashik-3.

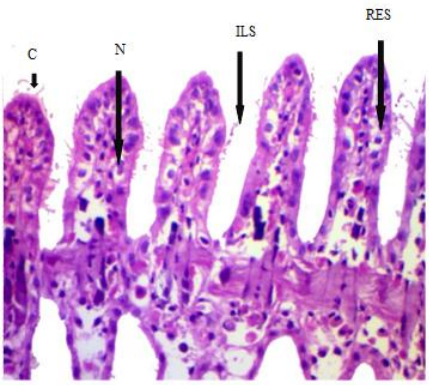
Pilot tests were carried out to find the range of lethal concentrations for pesticide Lamda-Cyhalothrin (123.02 ppm) based on this experiment. For each concentration 10 mussels were selected for acute toxicity test was performed under static condition up to 96 hrs. Simultaneously, control set was run in dechlorinated tap water along experimental set.Median lethal concentration, The regression equation between log concentration (X) in ppm and probit mortality (Y) was calculated using formula Y=a+ log b(X) and 95 % fudicial limit was find out by probit analysis (Finney, 1971).

Histopathplogical studies: Toxicity test to acute stress of lamda-Cyhalothrin, totest mussel *L. Marginalis* were exposed to acute toxicity for 96 hat LC_{50} concentration of Lamda-Cyhalothrin. Survived bivalve were scarified to remove gill and digestive gland and processed according to microtechnique. The gills and digestive gland was isolated and fixed in aqueous Bouins fluid, dehydrated, cleared and embedded in paraffin wax(56-58^{0}C) and sectioned at 5-8µ (Lieca microtome RM 2235).The sections were stained with Delafield´s hematoxyline – Eosin and mounted in DPX. The stained sections were screened for histopathological changes in gill and digestive gland along with control section and microphotographed .

REULTS AND DISCUSSION

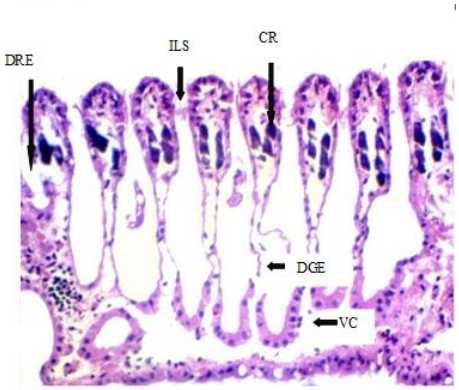
In present studies the typical architecture of gill lamellae of control bivalve consist of large number of closely set, thin, vertical, gill filaments with porous like structure perforated by minute opening bound by filaments .The gill filament connected by horizontal bars . Gill filaments are composed of connective tissue. The margin of gills covered by ciliated epithelium and supported by chitanousrods (Figure 1).The exposed bivalve to λ – Cyhalothrin exhibit a altered typical architecture of gills with degenerative changes observed in the nuclei of epithelial cells,pycnotic nuclei and necrosis of connective tissue, in certain region reduction in intrallamilar space

Fig: 1



V.S of gill Normal (10X)
G.L: Gill lamellae R.E:Respiratoryepithelium, ILS: Interlamellaer Space, N: Nucleus ,C:Cillia

Fig : 2



V.S of gill after acute treatment of λ- Chylothrin (10X)

DGL: Degenerated Gill lamellae , DRE: Degenerated Respiratory epithelium, ILS: Interlamellaer Space, C.R: Chitinous rod , V.C; Vaculated cytoplasm

The lamellae arecollspseddue to heavy damage to epithelial cells with disturbed Chitanous rod (Figure 2). Normal digestive gland (fig.3) of *L. marginalis* is oval shape with dark purple coloured nuclei present at the base of the cells arranged in proper manner and each nucleus stained with same intensity. Distinct lumen was observed in between cells. The elongated Secretary cells were observed with pigmented granules. Degenerative changes such as decrease intertubular spaces between tubules, tubular atrophy, digestive cell get separated from basement membrane, Cells get shirked indigestive gland of bivalve exposed to λ-Chyalothrin (Figure 4).

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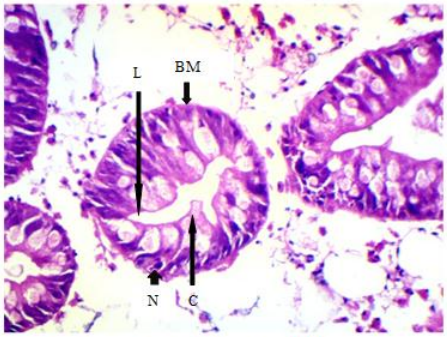
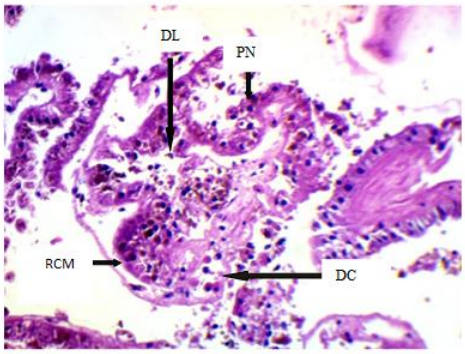
Fig: 3



T.S of digestive gland Normal (10X)

N: Nuclei , C: Cytoplasm, L: Lumen, CM: Cell membrane

Fig: 4



T.S of digestive gland after acute treatment of λ- Chylothrin (10X)

RCM: Ruptured cell membrane, DL: Degenerated lumen , DC: Degeneration of cell

Cells of epithelium of gill play dual role in respiratory gas exchange and feeding in mussels. (Marigomez *et al*., 2002).Gill lamellae of control bivalve consist of large number of closely set, thin, vertical, gill filaments. The gill lamellae have porous like structure perforated by minute opening bound by filaments .The gill filament connected by horizontal bars, gill filaments are composed of connective tissue. Gills covered by ciliated epithelium and supported by chitanous rods (Figure 1). Bivalve exposed to acute doseof λ – Cyhalothrin exhibit a altered architecture of gills like pycnotic nuclei and necrosis of connective tissue and in certain region reduction in intrallamilar space ,lamellae observed collapsed due to heavy damage to epithelial cells (Fig. 2) and Overall cell size is reduced. Skidmore and Tovell (1972) reported lifting away of epithelial covering of secondary lamellae in the form continuous sheets from pillar cell system due to intoxication of Zn .The histopathological changes observed after exposure of λ - Cyhalothrinshow same changes. Wayker and Lomte (2002) noticed the histological changes in gill of freshwater bivalve *Parreysia cylindrica* exposed to endosulfan. *L. marginalis* showing ruptured epithelia, hypertrophic nuclei, Dilated sinus when exposed to Dimethoate (Kumar Saurabh, 2012).

Histological abnormalities caused due to toxicity ofmonochrotophos (36% EC) caused severe damage to cilia, gill filaments, branchial nerve, heamolymph vessels and Cytoplasam showed disintegration due to swelling in respiratory epithelium (Santhiya, Ramasamy and Gayathri, 2015). Histopathological changes likebulging of primary and curling of secondary gill lamellae, degeneration and necrosis of epithelial cells, distortion of secondary gill lamellae, destruction of epithelial cells, irregular appearance of gill lamellae were observed in *L. marginalis* exposed to chloropyrifos (Musthafa and Amanulla, 2011). In present studies similar degenerative changes observed in gill of *L. marginalis* due to Lambda- Cyhalothrin.

Normal digestive gland (Figure 3) of *L. marginalis* is oval in shape with dark purple coloured nuclei present at the base of the cells arranged in proper manner and each nucleus stained with same intensity .Distinct lumen was observed in between the cells .Secretary cells were observed with pigmented granules, and elongated. The digestive gland of molluscs have been known as target organ and play important role in pollutant uptake,intracellular food digestion and metabolism. (Rainbow and Philips, 1993). In *L. marginalis* destruction of the basement membrane of the hepatic tubules and cell surface of the digestive cells observed after cadmium exposure (Yasmeen Shaikh, 2012).

Histopatlogocal changes such as gradual hypertrophy and hyperplasia lead to increased height of epithelial cell, psudo-stratification, destruction of epithelial cell lining after dimethoate (Saurabh Kumar, 2011). Thiodan (Endosulfan 35%EC) treated *L. corrious* during winter season shows degenerative changes that is necrosis of parenchyma, damaged basement membrane (Kambleand Mahajan, 2013; Muley and Mane, 1986) noticed similar changes and stated that *L. marginalis* is more sensitive than *L. corrianus*. In present investigation degenerative changes such as increased intertublar spaces between tubules, tubular atrophy, digestive cell get separated from basement membrane (Figure 4). This histopathological changes caused by Lambda-Cyhalothrinin digestive gland of bivalve *L. marginalis*.

CONCLUSION

The present study showed intoxication of LC_{50} valueof Lamda-Cyhalothrin is 123.02ppmis toxic to fresh water bivalve *L. marginalis* and is sensitive to Lamda- Cyhalothrinpyrethroid pesticide. Lamda- Cyhalothrin responsible for destruction of normal cell architecture of digestive gland as well as gills. This study indicate that pesticides present in aquatic environment is toxic to non target fresh water animals.

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