IMPACT OF TOXICANTS IN MUD CRAB (*Scylla serrata*) MUSCLE

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ABSTRACT

Chlorpyrifos (CPF) and Cypermethrin (CPM) are two toxicants, commonly used in agriculture field to control the insecticidal activity throughout the world. The usages of this toxicant, it affects the aquatic system. The present study has been to examine the enzymatic activates of two toxicants in muscle tissues of mud crab (*Scylla serrata*). The crabs were introduced in these toxicants for 24 hrs in laboratory conditions to analyze the enzyme activities of ALP, SDH andLDH in the muscle of mud crab. ALP and SDH declined in Chlorpyrifos showed mean value 3.88 ± 0.29 µg/ PNPP to PNP/100 mg and 8.42±0.62 *MIU/min/mg* than the cypermethrin (3.02±0.38µg/ PNPP to PNP/100 mg and 7.89±0.51 *MIU/min/mg*) and control(9.38 ± 0.58*MIU/min/mg* and 4.01±0.49 µg/ PNPP to PNP/100 mg). LDH elevated in both the group particularly in Chlorpyrifos (9.01 ± 1.32 µg/100mg) than control (7.98±0.62µg/100mg), therefore Chlorpyrifos showed maximum impact on muscle tissues of mud crab than cypermethrin.

Key words: Mud crab, toxicants and biochemical studies.

INTRODUCTION

Many of the crab species are burrowing in nature and frequently alter the surface characteristics and drive the nutrient cycling (Pandya, 2011). The mud crab (*Scylla serrata*) is an economically and recreationally important crab distributed throughout the coasts of Indo-West Pacific, Chennai, Kakinada, Visakhapatnam, Puri, Paradeep, Sandheads and Lakshadweep, Andaman and Nicobar Islands etc., Adult mud crabs are generally found in muddy, mangrove-lined estuaries, and the vigorous females move offshore to spawn (Hill 1994). Pesticides commonly used in agriculture and public health, adversely affect the natural environment and non-target aquatic organisms through surface runoff from the treated area (Singh *et al*., 2008; Stueckle *et al*., 2008). These pesticides have various physiological effects on the pests, such as inhibitory effects on growth, food intake, metabolism, enzyme activity and general development (Tungare and Sawant, 2000) and also adverse effects on aquatic animals. Chlorpyrifos an organophosphate (OP) is the second largest used pesticide in India. It is used to control cutworms, corn rootworms, flea beetles, flies, termites, fire ants and lice (Mathur and Tannan, 1999). There are some reports on the toxicity of OP pesticides to crabs (Radhakrishnaiah and Renukadevi, 1990; Senthil Kumar *et al*., 2007; Ghedira *et al*., 2009). Cypermethrin is a synthetic pyrethroid used as an insecticide in large-scale commercial agricultural applications as well as in consumer products for domestic purposes. The impact of pesticides on aquatic animals is an important aspect of chemical contamination of the aquatic environment (Narra, 2014). The present study investigated the toxicity effect of pesticide Chlorpyrifos and cypermethrin on the enzymatic aspects of muscles of the mud crab (*Scylla serrata*).

MATERIALS AND METHODS

The mud crab was collected from Pulicat lake marshy area, Thiruvallur District, Tamil Nadu, India. The crab were collected by hand picking method and acclimatized to the laboratory. The crab was exposed to these two toxicants such as Chlorpyrifos and Cypermethrin for 24 hours. After exposure of these two toxicants in mud crabs, the muscles were dissected for further studies. LC50 values were estimated by using Abbott (1925) and mortality was observed at every 24hrs of exposure. Succinate dehydrogenase (Nachalas *et al*., 1960); dehydrogenase (King, 1965) and alkaline phosphatase (Tenniswood *et al*., 1976) were analyzed using the respective methods.

RESULT

ALP and SDH activity are declined in the two toxicant groups but maximum values were observed in Chlorpyrifos (3.88 ± 0.29 µg/ PNPP to PNP/100 mg and 8.42±0.62 MIU/min/mg)muscles of controlled crab9.38 ± 0.58 MIU/min/mgand 4.01±0.49 µg/ PNPP to PNP/100 mg) than the cypermethrin (3.02±0.38 µg/ PNPP to PNP/100 mg and 7.89±0.51 MIU/min/mg) and control (9.38 ± 0.58 MIU/min/mgand 4.01±0.49 µg/ PNPP to PNP/100 mg) (fig:1and 2). LDH elevated in both the group particularly in Chlorpyrifos (9.01 ± 1.32 µg/100mg) than control (7.98±0.62µg/100mg), (fig: 3).

DISCUSSION

In this study the mud crab, was treated with Chlorpyrifos and cypermethrin and revealed a significant decrease in ALP and SDH values. When an organ is diseased due to the effect of a toxicant, enzyme activity increased or it may be inhibited due to the active site being denatured or distorted. Pesticides are highly toxic substances when entered to the ecosystem alters the growth rate, nutritional value, behavioral pattern etc., of the organism (Abdul *et al.*, 2010) .The physiological state of the exposed organism and lead to the alteration in enzymatic activities. They also cause distortions in the cell organelles, which may bring elevation or inhibitions in the activity of various enzymes (Vijayavel and Balasubramanian, 2006). The present study in the mud crab on enzyme activity in muscles expressed the decreased activity of ALP and SDH and increased activity of LDH compared to the control but maximum impact was observed in the Chlorpyrifos among the toxicant. Therefore mud crab with Chlorpyrifos showed changes in the morphology of the muscle. The muscle tissue was very fragile and the lobes were reduced in size when compared with that of the control. Chlorpyrifos showed maximum impact on muscle tissues of mud crab than cypermethrin.

The results of Mayekar *et al.*, 2012 revealed that low SDH activity and high LDH activity in throughout this work. The muscle tissues of Crab *Scylla serrata* exposed to Nickel and the higher values appeared to be the probable cause of cellular damage and physiological stress. Decreased SDH activity and increased LDH activity was observed in crab treated with Chlorpyrifos and cypermethrin. This might be due to the physiological disturbances caused by the pesticide which affects enzyme activity. The pesticide can bring about distortions in the cell organelles which may inhibit the activity of enzymes. The non-availability of oxygen, inhibition of SDH and simultaneous elevation of LDH may suggest a bias towards the anaerobic glycolytic pathway. Mayekar *et al.*, 2012 had reported that exposure of nickel on the Ovary of Female Crab *Scylla serrata* showed increased ACP and ALP activity. The results of S. Schrader and Narra *et al.* [2012] showed increased ACP activity and decreased ALP activity in the tissue of *Barytelphusa guerini*, exposed to Chlorpyrifos. Similar reports were observed in fresh water crab, *Spiralothelphusa hydrodroma* treated with the Cypermethrin. Patil *et al.* 2014 also reported elevated level of ACP and ALP activity in the different tissues of freshwater crab, *Paratelphusa (Barytelphusa) jacquemontii* exposed to Malathion. Increased ALP and decreased ACP activity in Spermatheca and Ovary of *Uca triangularis* on exposure to Endosulfan and Chlorpyrifos and Carbaryl was observed. The increase in ACP activity was inferred as altered metabolism due to stress induced by the toxic pesticides present in the aquatic eco system.

Fig: 1Alkaline Phosphatase content in mud crab (µg / PNPP to PNP/100 mg)

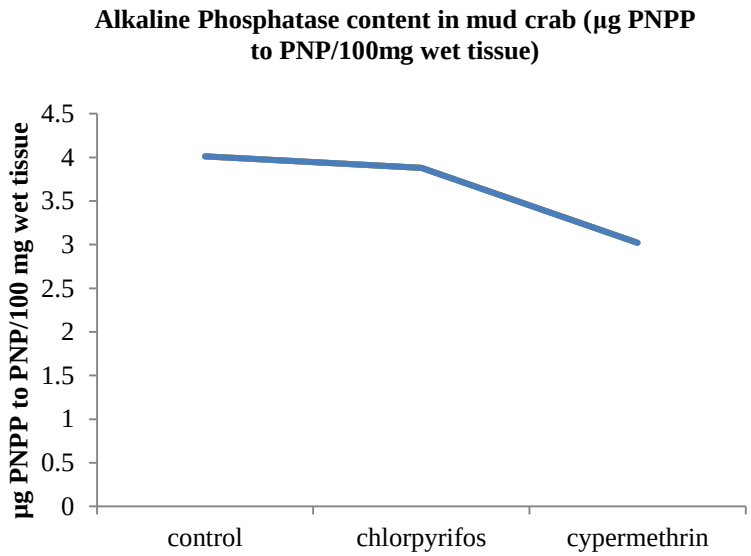


Fig: 2 Succinate dehydrogenase content in mud crab (MIU/min/mg/)

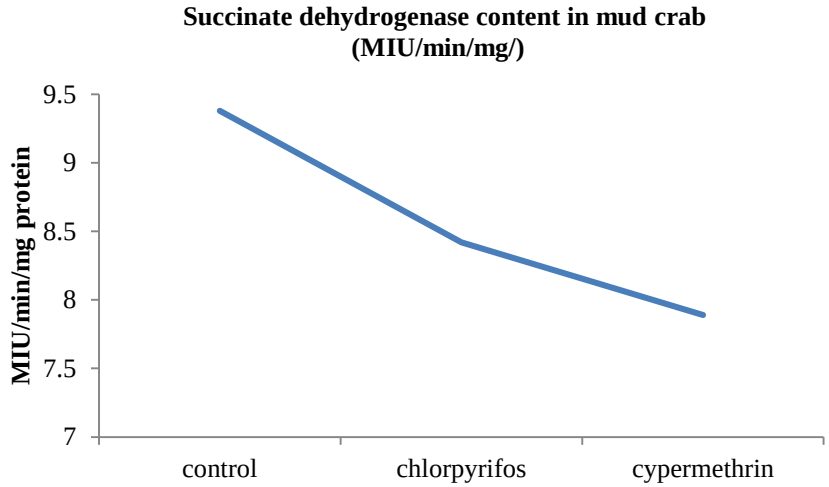
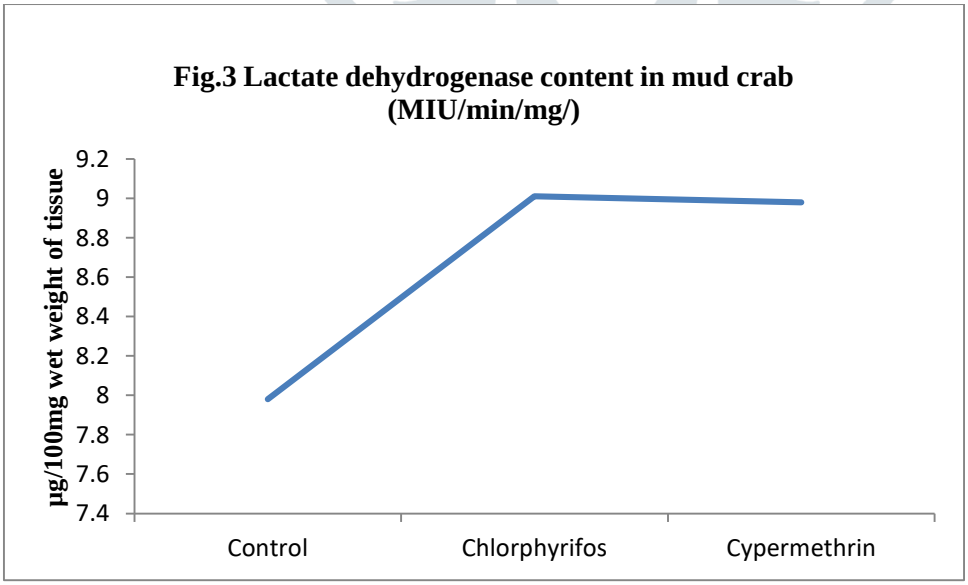


Fig.3 Lactate dehydrogenase content in mud crab (MIU/min/mg/)



CONCLUSION

The crabs were exposed to sub lethal concentration (1/10th of 24 h LC_{50}) of Chlorpyrifos and cypermethrin for a period of 24 hrs. The treatments of these two toxicants brought about enzyme activity in muscles of mud crab expressed the decreased activity of ALP and SDH and increased activity of LDH compared to the control but maximum impact was observed in the Chlorpyrifos among the toxicant. Therefore mud crab with Chlorpyrifos showed changes in the morphology of the muscle. The muscle tissue was very fragile and the lobes were reduced in size when compared with that of the control. Chlorpyrifos showed maximum impact on muscle tissues of mud crab than cypermethrin. The significance of these studies as bioindicator for assessing the toxicity and economic importance of the crab were discussed.

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