TOXICANT IMPACT ON ENZYMATIC CHANGES IN INDIAN MAJOR CARP (*Catla catla*) BRAIN

E. Rajalakshmi[*1], S. Pandiammal[1], P. Senthilkumaar[1] and J. Manju Bashini[2]
[1]P.G. and Research Department of Zoology, Sir Theagaraya College, Chennai, India
[2]Department of Zoology, L.N. Government College, Ponneri, Tamil Nadu, India
E-mail - rajismf@gmail.com

ABSTRACT

Fingerlings of *Catla catla*, Indian major carp introduced in to two toxicant ie., pesticides Chlorpyrifos and fungicide Hexaconazole for 24 hrs in laboratory condition to analyze the enzyme activity SDH, LDH and ALP in the brain tissue fishes. SDH and ALP declined in Chlorpyrifos showed mean value 3.14 ± 0.03*MIU/min/mg* and 5.71±0.01µg/ PNPP to PNP/100 mg than the fungicide (3.84±0.01 *MIU/min/mg* and 5.34±0.02 µg/ PNPP to PNP/100 mg) and control (4.75±0.03 *MIU/min/mg* and 7.04±0.13). LDH elevated in both the group particularly in Chlorpyrifos (6.57 ± 0.12 µg/100mg) than control (7.04±0.13 µg/100mg), therefore Chlorpyrifos showed maximum impact on fish brain than Hexaconazole.

KEYWORD: Chlorpyrifos, Hexaconazole, enzyme aspects.

INTRODUCTION

Pesticides are one of the most potentially harmful chemicals, due to continuous and over usage they end up in the environment and cause deleterious and irreversible contamination on the environment and the non-target organisms which entirely dependent on the respective habitat (Velcheva *et al.*, 2012). 1960,s Green Revolution have increased the agricultural productivity by increasing the usage of pest controls, cultivating surfaces ,planting hybrid crops with high yields, and mechanizations (Briggs, 2009). Pesticides are the toxic chemicals produced to kill the harmful and unwanted rodents, insects, fungi etc., which ultimately increases the crop yield. Besides their beneficial properties many pesticides discovered to be harmful to the environment. Most of them persist in soils and sediments which somehow enter in to the aquatic medium and accumulate in the tissues of the organism which lead alterations in behaviour, histology, biochemical and enzyme activities. The other adverse effects were where they interfere with endocrine system in both wildlife and Humans, which can modulate the system through multiple mechanisms of action and certainly cause cancerous tumors, birth defects, and other developmental disorders. Many Animal models have indicated that these chemical can cause adverse effects which were often permanent and act as epigenetic modulators which led to potential transgenerational effects (Anway *et al.*, 2005; Waring and Harris, 2011). Among them fishes were considered more sensitive and reliable model to detect the toxicity impact because of their intimate connection with the aquatic medium and having big place in the human diet due to their nutritive values. Present study investigated the toxicity effect of pesticide Chlorpyrifos and fungicide Hexaconazole on the enzymatic aspects of brain of the Indian major carp *Catla catla.* Both the xenobiotics are the endocrine disrupting chemicals which cause hazardous impact on the exposed organism.

MATERIALS AND METHODS

Catla catla fingerlings of uniform size in the range of 6 to 12 cm and weighing 10 to 17 gms Were collected from the Poondi reservoir, Thiruvallur District, Tamil Nadu, India. The fingerlings were brought to the laboratory in the oxygenated plastic bags and acclimatized for week in the laboratory conditions. The fishes were fed with formulated feed throughout the experiment. Fingerlings were exposed to the two pesticides Chlorpyrifos and fungicide Hexaconazole for 24 hours and after 24 hrs of exposure brain was 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); Lactate

dehydrogenase (King, 1965) and alkaline phosphatase (Tenniswood et al., 1976) were analyzed using the respective methods.

RESULT

SDH and ALP activity declined in both the toxicant treated group but maximum was observed in Chlorpyrifos (3.14 ± 0.03 *MIU/min/mg* and 5.71±0.01 PNPP to PNP/100 mg) treated fishes compared to the brain in the control(4.75±0.03 *MIU/min/mg* and 7.04±0.13PNPP to PNP/100 mg) (fig:1 and 3).LDH in both the treated group showed elevated activity but maximum in Chlorpyrifos (6.57±0.12µg/100mg) than Hexaconazole (6.20±0.07 µg/100mg) and control (5.90±0.03 µg/100mg) (fig:2).

DISCUSSION

Pesticides and fungicides are highly toxic substances when entered to the ecosystem alters the growth rate, nutritional value, behavioral pattern etc., in the organism (Abdul *et al.,* 2010) .this xenobiotics brings disturbances in 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 fish *Catla catla* on enzyme activity in brain expressed the decreased activity of SDH and ALP and increased activity of LDH compared to the control but maximum impact was observed in the Chlorpyrifos among the toxicant.

Succinate dehydrogenase participates in each acid cycle which catalyses the reversible oxidation of succinate to fumarate and electron transport chain and it is also taken as a sign of the amount of operation of TCA cycle (Bhagyalakshmi *et al*., 1984). Declined activity of SDH denotes that toxicant stress was related to the inhibition of mitochondrial respiratory mechanism or arrangement in ultra structure, architectural integrity and porosity of mitochondria (Tripathi and Priyanka, 2004). This xenobiotic stress prevents the transfer of electrons to molecular gas which leads to the inhibition of SDH activity and shifts the aerobic metabolism to anaerobiosis (Shailendra Kumar Singh et al., 2010). The present result was supported by the finding of Maisnam Sapana Devi and Abhik Gupta (2014). *Anabas testudineus* showed decreased activity of SDH in muscle and liver in permethrin treated group. Leena muralidharan (2014) observed decreased activity in liver and muscle of *Cyprinus carpio* in fenthion treated group.

LDH related to cellular metabolic activity and acts as an important catalyst between the glycolytic pathway and the TCA cycle. LDH forms the centre for a delicately balanced equilibrium between catabolism and anabolism of carbohydrates and also involved in cellular metabolic activity (Abston and Yarbrough, 1976; Everse and Kaplan, 1973). The increase in LDH activity is associated on anaerobic carbohydrate metabolism of the fishes and may be due to the lactate conversion into pyruvate at the expense of NAD (Al-Ghanim and Mahboob, 2012). Ozgur Fırat *et al.,* (2011) observed the increased LDH level in the *Oreochromis niloticus* exposed to thecypermethrin, copper and lead. Abhijith *et al*., 2016 recorded the similar result in *C. catla* treated in methyl parathion. Alkaline phosphatase is a metallo enzyme that catalyses non-specific hydrolyses of phosphate mono esters (Qing-Xi-Chen *et al*., 2000) and it is a brush border enzyme that splits numerous phosphorous esters in associate alkaline pH and induces membrane transport. It is also concerned in synthesis of bound enzymes, protein synthesis, glycogen metabolism and secretory activity. Reduction in ALP activity is an indication of inhibition of this enzyme (Inyang *et al*., 2016) and also might be down metabolic demands and due to electrolytic imbalance caused by tissue over association (Anderson *et al*., 2002). In present study *Catla catla* revealed the more toxical impact towards the Chlorpyrifos than the Hexaconazole which represents the hazardous nature of the pesticide in the aquatic environment.

Fig:1 Succinate dehydrogenase content in Catla catla (MIU/min/mg/)

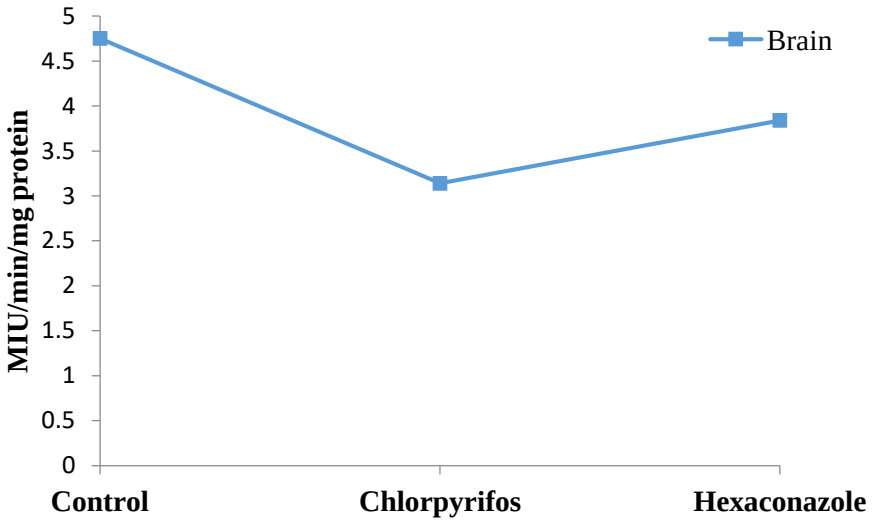


Fig.2 Lactate dehydrogenase content in Catla catla (µg/100mg wet weight of tissue)

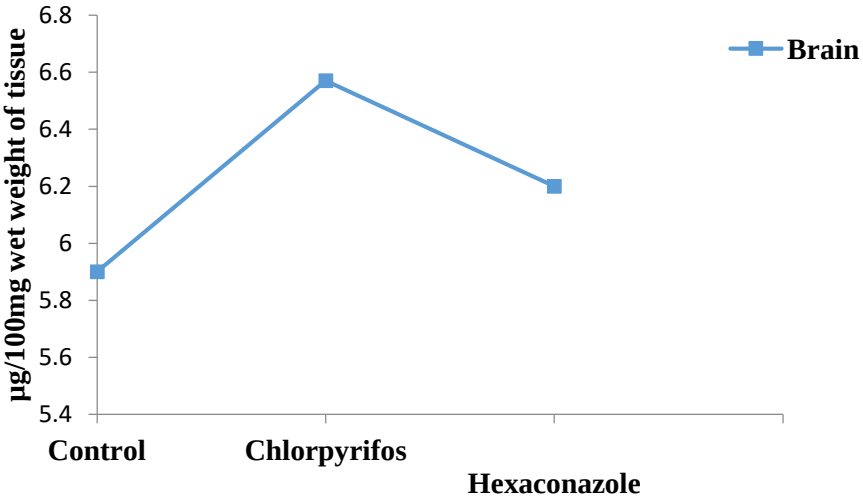
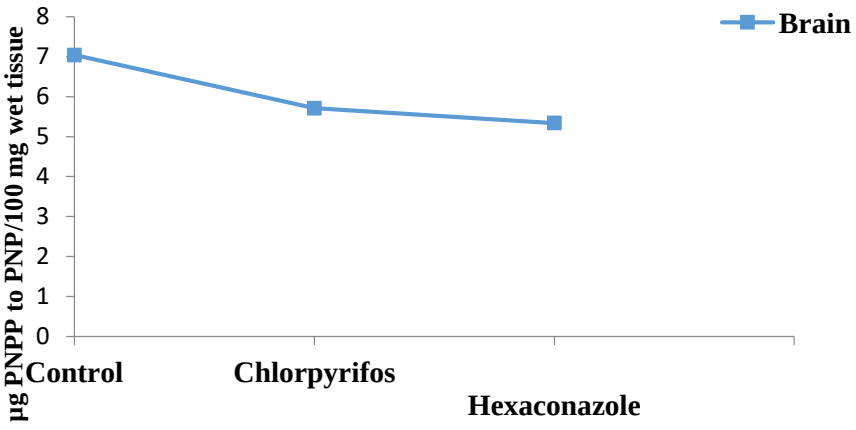


Fig:3 Alkaline Phosphatase content in Catla catla (µg PNPP to PNP/100mg wet tissue)



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