Toxicity study of Cypermethrin, Chlpropyrifos,Malathion, Trizophas and Imidachloprid in fresh water fish *Mystus seenghala*

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ABSTRACT

The present study was carried out during summer season' 2017 to investigate the toxicity effects of cypermethrin, Chloropyrifos, malathion, trizofas and Imidachloprid in different concentration (50% of permissible limit, permissible limit, five and ten times of permissible limit) with exposure for 0, 24, 48, 72 and 96 hours (under laboratory condition) for fresh water fish *Mystus seenghala*. The outcome was found malathion was more toxic as compare to other selected insecticides.

Key words: Toxicity, *Mystus seenghala*, insecticides

INTRODUCTION

Fishes are very sensitive to the oxygen content and chemistry of the water that surrounds them. Any type of chemical imbalance cause big loss/disease in fish population on their habitat. There is a very close relationship between the metabolism of aquatic organism and hydro biological parameters in a fresh water body (Deshmukh and Ambore, 2006). At present condition bioaccumulation is biggest problem. Pesticides bioaccumulation on fish. Fishes are good indicators of pollution stress and have wide range of tolerance. Fishes respond to change in physical, chemical and biological conditions of aquatic ecosystem caused by human activities (Plafkin *et al.*, 1989). The most frequently used insecticides were cypermethrin (20%). Cypermethrin is a synthetic pyrethroid used as an insecticide in large-scale commercial agricultural applications as well as in consumer products for domestic purposes. It behaves as a fast-acting neurotoxin in insects. Exposure to sunlight, water and oxygen will accelerate its decomposition. Cypermethrin is highly toxic to fish, bees and aquatic insects, according to the National Pesticides Telecommunications Network (NPTN). Imidacloprid is a systemic insecticide that acts as an insect neurotoxin and belongs to a class of chemicals called the neonicotinoids which act on the central nervous system of insects. Chlorpyrifos exposure may lead to acute toxicity at higher doses. Persistent health effects follow acute poisoning or from long-term exposure to low doses, and developmental effects appear in fetuses and children even at very small doses. Acute poisoning results mainly from interference with the acetylcholine neurotransmission pathway, leading to a range of neuromuscular symptoms. Malathion is an organophosphate insecticide which acts as an acetylcholinesterase inhibitor. Triazofos is an organophosphate pesticide used in acaricides, insecticides and nematicides. When exposed to pesticides fish show rapid movements in body, restlessness, convulsions, excess mucous secretion, respiratory problems, loss of balance and change in color. In several fish species exposed to different pesticides, similar behavioral changes have also been

monitored (Haider and Inbaraj, 1986). *Mystus seenghala* , a teleost fish mostly found in ponds, river and paddy fields. These studies are very important as the toxicity effect on fish of different insecticides at different concentration. Pollutants such as insecticides may affect significantly certain physiological and biochemical processes that different kinds of insecticides can cause serious impairment to health status of fishes, Banaee M, 2013 (EPA, 2013).

MATERIAL AND METHODS

The healthy fish *Mystus seenghala* were collected from different locations of selected water bodies of Raipur district and brought to laboratory without any mechanical injury with similar length. Fish were acclimatized under laboratory condition which in glass aquaria with 200 liter water quantity was used to maintain the five fish in number. The toxicity test is to calculate in 0- 96 hrs was carried out by different concentration of different insecticides prepared in low dose, under permissible limit dose according to WHO and EPA, five times and ten times than observed the toxic effect in fish behavior and mortality based on their persisting time (Zhang et al., 2010).

RESULTS

The fish were exposed to different concentration of different insecticides, after exposure of cypermethrin at 0 hrs of fish behave was normal, after 24 hrs fish sited bottom of all five glass aquaria. At low and permissible limit concentration fish activity was observed less eating habit and slow swimming but after 48 hrs it shows irritation, loss of equilibrium at the concentration of 0.200µg/L but all are alive, the major abnormalities shown at dose 0.400 µg/L, observation was abnormal restlessness swimming behavior observed after 24 hours one fish died after 48 hrs in number of five fishes, four fishes alive but they loss equilibrium at 96 hrs observation was found that fishes are normal swimming. At higher concentration same results are also found by Ali Haider Md. Et al., 2017 , Ansari and Ansari, 2012. After exposure of chlorpyrifos, malathion, trizofas (organophosphate) at 0 hrs of fish behave was normal, behavior is also considered a promising tool in ecotoxicology behaviour (Cohn et al,. 1997) is an integrated result of endogenous and exogenous processes and low level of exposures have been implicated in various behavioral and physiological impairments (Sandahl et al,. 2005). In this investigation the observation was *Mystus seengala* fish, persisting behavioral dysfunction after 24 hrs chlorpyrifos exposure similar results was observed by Sledge et al,. 2011 and Levin et al., 2004. Swimming behavior of fish is frequently observed as a response in toxicity investigations because altered locomotors activity can indicate effects to the nervous system. In this investigation, the exposure of *Mystus seengala* to chlorpyrifos resulted in **48 hrs** one fish died. Fish was harassed progressively with time before death. Fishes were lethargic and at the time of death exhibited transient hyperactivity before collapsing Sharbidre et al, 2011. Others were exhibition of aggressive behavior, gulping of water and abnormal, erratic swimming movement's similar observation reported by Nobonita Deb and Suchismita Das, 2013. After exposure of malathion- At different concentration exposure of malathion changes in behavioral responses of fishes started. Exposure of malathion in 0 hrs of dose 160µg/L and permissible limit dose 190 µg/L all fishes were alive. At 0 hrs Fishes are immediate migrated at bottom. After 24 hrs exposed to malathion showed speedy movements as compared to control. The normal resting period between each swimming action in control was 252.02±2.88 seconds whereas this period decreased with an increase in pesticide concentrations according to Yadav N et al., 2018. This investigation two fish died at 24 hrs on dose of 9500 µg/L. The opercular movement per minute showed increasing trend with the increase in concentration of malathion. Malathion exposure caused hypoxia. Other three alive fishes were movements like S jerking, threat and burst swimming were increased in the experimental fishes

when exposed to malathion. The increase in swimming activity may be due to disruption of shoaling behavior which occurs because of the stress of the toxicant (Venkata *et al*., 2008). After 72 hrs two more fishes died. Under toxic condition the oxygen supply becomes deficient and so the fish breathe rapidly (Susan *et al*., 2010). Rapid opercular movement was also confirmed by Wasu *et al.,* (2009) in *Clarias batrachus* treated with Carbaryl and malathion. Exposure of trizophos in 0 hrs of dose 10µg/L and permissible limit dose 0.01- 0.40 µg/L all fishes were alive and no significant behavior changes and anatomic changes observed. After 24 hrs exposure of trizophos the behavioral changes like increased opercula movements, hyper-activity of all fins, increased rate of swimming, loss of balance etc. after 48 hrs the observation in the triazophos exposed fishes are probably due to caudal bending which was noted during entire exposure period being higher in higher pesticide concentration exposure group. Under investigation after 72 hrs one fish died in concentration does of 0.2 µg/L because caudal bending, a kind of paralysis might have induced imbalance in swimming pattern leading in turn to surfacing behavior similar result found by Singh et al., and Balint et al., 1995. Under investigation other four fishes were observed hyper-activity and increased rate of swimming. At 96 hrs all four fishes alive. After exposure of imidachloprid- After 24 hrs exposure of imidachloprid treated groups and fish showed abrupt and sluggish swimming movements in various directions. At **48 hrs** one fish died and other fishes was occasional jumping and hitting against the walls of tanks similar result was also found in *L. rohita* experienced rapid scale loss and mucous secretion, Abdul Latif and Furhan Iqbal , 2014. Due to insecticides, body colour changed in treated groups. As the Imidacloprid exposure time increased, after 72 hrs fish tend to recover from disturbed condition and frequency of abnormal behavior decreased, at 96 hrs fish swimming speed remained slow as compared to previous exposure time the findings are similar with Abdul Latif and Furhan Iqbal , 2014.

Conclusion

On the basis of observation made in the above it is conclude that the toxicity effects of malathion was more toxic for fresh water cat fish *Mystus seenghala* as compare to other selected insecticides.

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Insecticides exposure µg/L Dose	Number of animals	Mortality[h]				
		0	24	48	72	96
Cypermethrin Low[0.02]	5	0/5	0/5	0/5	0/5	0/5
Permisible Limit [PL] [0.01-0.04]	5	0/5	0/5	0/5	0/5	0/5
5xPL [0.200]	5	0/5	0/5	0/5	0/5	0/5
10xPL [0.400]	5	**0/5**	**0/5**	**1/5**	**0/4**	**0/4**
Chlorpyrifos Low[15]	5	0/5	0/5	0/5	0/5	0/5
Permisible Limit [PL] [30]	5	0/5	0/5	0/5	0/5	0/5
5xPL [150]	5	0/5	0/5	0/5	0/5	0/5
10xPL [300]	5	**0/5**	**0/5**	**1/5**	**0/4**	**0/4**
Malathion Low [95]	5	0/5	0/5	0/5	0/5	0/5
Permisible Limit [PL] [190]	5	0/5	0/5	0/5	0/5	0/5
5xPL [950]	5	0/5	0/5	0/5	0/5	0/5
10xPL [1900]	5	**0/5**	**2/5**	**0/3**	**2/3**	**0/1**
Trizophos Low[0.01]	5	0/5	0/5	0/5	0/5	0/5
Permisible Limit [PL] [0.02]	5	0/5	0/5	0/5	0/5	0/5
5xPL [0.1]	5	0/5	0/5	0/5	0/5	0/5
10xPL [0.2]	5	**0/5**	**0/5**	**0/5**	**1/5**	**0/4**
Imidachloprid Low[100]	5	0/5	0/5	0/5	0/5	0/5
Permisible Limit [PL] [200]	5	0/5	0/5	0/5	0/5	0/5
5xPL [1000]	5	0/5	0/5	0/5	0/5	0/5
10xPL [2000]	5	**0/5**	**0/5**	**1/5**	**0/4**	**0/4**

Table 1.Acute toxicity of insecticides exposure on fish *Mystus seenghala* in different doses and mortality recorded up to 96 h.

0/5= No Mortality , 1/5=20%, 2/5=40%, 4/5=80% Mortality