Poll Res. 39 (2) : 429-431 (2020)

ISSN 0257–8050

STUDY ON TOXICITY OF LEAD CHLORIDE (PBCL2) ON *MYSTUS CAVASIUS* FROM MULA-MUTHA RIVER, PUNE

DNYANDEO GORAKHE[1] AND NAVNATH CHANDANSHIVE[2]

[1]Prof. Ramakrishna More College, University of Pune, Pune, M.S., India
[2]Fergusson College, University of Pune, Pune, M.S., India

(Received 28 January, 2020; accepted 10 March, 2020)

ABSTRACT

Heavy metals above the permissible limit are toxic to the aquatic organisms. They can accumulate in the tissues of aquatic organisms, especially in bottom-feeding fish and cause various dangerous effects which can be harmful to humans too. The present study was carried out to assess the behavioural responses and survival rate of air breathing fish *Mystus cavasius* to exposure of lead chloride. Behavioural effects are important in the assessment of risk from chemical exposure in the environment. The 96h LC50 values determined using Litchfield and Wilcoxon graphical method. Various behavioural and physiological changes were observed in *M. cavasius*. Also the survival rate was seen to be decreased with increased concertation of lead chloride. Therefore it can be concluded that *Mystus cavasius* is sensitive to higher concentration of lead chloride.

KEY WORDS : Fish, Leadchloride, Water pollution, Heavy metal, *Mystuscavasius*

INTRODUCTION

Pollution of different water environments with heavy metals is a matter of serious concern for human health. These toxic heavy metals are introduced into aquatic ecosystem via different routes such as industrial effluents, agricultural procedures, domestic garbage and mining activities (Merian, 1991). The heavy metals cannot be destroyed through biological degradation and have the ability to accumulate in ecosystem (G. Ambedkar and Muniyan, 2011). Therefore, these chemicals are harmful to aquatic ecosystems and consequently, to humans who are dependent on aquatic products as food sources (Bernet *et al.,* 1999). Among aquatic organisms, fish cannot escape from the detrimental effects of these pollutants, and are therefore generally considered to be the most relevant organisms for pollution monitoring in aquatic ecosystems (van der Oost *et al.,* 2003). Besides prevalence of exotic fishes, sewage and industrial pollution of river waters is the main reason for depletion of fish species (Suter, 1944). There are at least 62 species of fish in the Mula and Mutha rivers flowing through Pune (Wagh and Ghate, 2003)

Median lethal dose (LC50) tests can measure the susceptibility and survival potential of animals to particular toxic substances such as heavy metals (Sadeghi and Imanpoor, 2015). Heavy metals at greater concentrations are toxic to aquatic animals and responsible for mortality (Naeem *et al.,* 2012) (Hedayati *et al.,* 2010). In the present study, the toxic effects of lead chloride on air breathing fish *Mystus cavasius* (Hamilton-Buchanan)(Figure 1) *were* investigated.

MATERIALS AND METHODS

Healthy adult fish *Mystus cavasius* (Hamilton-Buchanan)of 38.8g(approx.) and 13.5cm (approx.) lengthwere procured from the local fisherman of fish station: Aundh and acclimatized in 28 ^{o}C in 15L of water (aeration provided) 7 days prior to the testing. To all the fish samples commercially available food was given. The percentage survival of *M.cavasius* at various concentrations of lead chloride was determined using Litchfield and Wilcoxon graphical

method. The test medium was changed daily to maintain the constant toxic concentration.

Observations on survival were made after 96 hours. Dead fishes were taken out immediately out of the glass tank and observed for post death changes. LC50 (concentration required for 50% mortality) values are calculated by graphical method (Chandanshive, 2013). Control group of animals was maintained simultaneously.

*The 96 hours LC_{50} of the PbCl2 is 23 mg/L in *Mystus cavasius.*

RESULTS AND DISCUSSION

Present study showed that due to the influence of PbCl2, behaviour pattern, swimming movements and opercular movements have been changed. Table 3 shows various types of behavioural changes were observed at sub-lethal concentration and LC50 (concentration required for 50% mortality). The 96 hours LC50 of the PbCl2 as shown by Graph 1 is 23 mg/L in *Mystuscavasius.*

Changes in behaviour and physiological responses were also observed such as opercular movement was faster than controlled, tail twitching

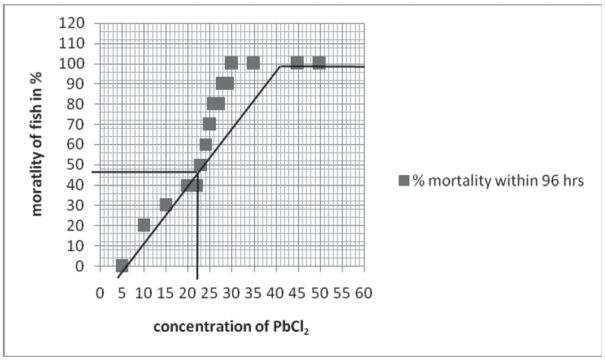

Fig. 1. Graphical presentation of LC50 value in *M. cavasius*

Table 1. Physico-chemical properties of the water samples used for toxicity of Lead Chloride

Factors	pH	Temperature	Nitrate	Phosphate	Suspended solids	Total alkalinity	Dissolved oxygen	Total acidity
Water sample used for mg/L toxicity of Lead Chloride	7.10-7.23 .	26-27 °C	18-19 mg/L	0.1-0.26 mg/L	Nil	174-176 mg/L	6.8- 7.01 mg/L	19-23 mg/L

Table 2. % Mortality of *M. cavasius* within 96 hrs

Sub group no.	No. of fishes exposed	lead chloride conc. mg/ltr	Mortality of fishes noted after time intervals									% mortality within 96 hrs
			30 min	60 min	2 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	96 hrs	
1	10	50	1	1	1	1	1	2	2	1	1	100
2	10	45	1	1	2	1	1	1	1	1	1	100
3	10	35	1	1	2	1	1	2	1	2	0	100
4	10	30	1	1	1	1	2	0	1	2	1	100
5	10	29	1	1	1	1	2	0	1	1	1	90
6	10	28	1	1	1	1	1	1	0	1	2	90
7	10	27	1	1	1	1	2	1	1	0	0	80
8	10	26	2	1	0	0	0	1	1	2	1	80
9	10	25	0	1	1	1	0	1	1	1	1	70
10	10	24	0	0	0	1	1	1	1	1	1	60
11	**10**	**23**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**50**
12	10	22	0	0	0	0	1	1	1	0	1	40
13	10	21	0	0	0	0	0	1	1	1	1	40
14	10	20	0	0	0	1	0	1	1	1	0	40
15	10	15	0	0	0	0	1	0	1	0	1	30
16	10	10	0	0	0	0	0	0	1	0	1	20
17	10	5	0	0	0	0	0	0	0	0	0	0
18	10	Control	0	0	0	0	0	0	0	0	0	0

Table 3. Behavioral and physiological Changes under the exposure of PbCl2:

Before Death (Sublethal Concentration)	After Death (LC50)
Hyperactivity	Decolouration of the body
Active air-breathing	Mouth opens
High opercular beats	Mucus thread
Jumping	Bile duct & gall bladder rupture
Fanning	Gills changes the colour to white
Tail twitching	Bleeding at the base of pectoral fin
Burst swimming	
Bleeding in gills	
Restlessness	
Nervous unconsciousness	
Mucus film formation	
Shortening of barbs	

jumping and fishes were trying to jump out of media. Body and gill colour also changes. Fishes also seemed to have nervous unconsciousness and restlessness. The main causes of death were found to be bleeding through gills, bile duct & gall bladder rupture and bleeding at the base of pectoral fin.

CONCLUSION

Various behavioural and physiological changes were observed in *M.cavasius.* Also the survival rate was seen to be decreased with increase concertation of lead chloride (Table 2). Therefore it can be concluded that *Mystus cavasius* is sensitive to higher concentration of lead chloride.

As fishes are included in human diet and has commercial value, it is important to study the effect of such heavy metals on fish.

REFERENCES

Ambedkar, G. and Muniyan, M. 2011. Bioaccumulation of some Heavy Metals in the selected five freshwater fish from Kollidam River, Tamilnadu, India. *Advances in Applied Science Research.* 2 (5) : 221-225.

Bernet, D., Schmidt, H., Meier, W., Burkhardt-Hol, P. and Wahli, T. 1999. Histopathology in fish: Proposal for a protocol to assess aquatic pollution. *J Fish Dis.* 22(1) : 25-34.

Chandanshive, 2013. Studies on toxicity of Detergents to Mystusmontanus and change in behaviour of fish Hamilton-Buchanan, 1822. Ichthyology.

Hedayati, A.A., Safahieh, A.R., Savari, A., Ghofle Marammazi, J. Detection of toxicity in yellowfin sea bream (*Acanthopagrus latus*). *World J Fish Marine Sci.* 2(2) : 86-92.

Litchfield, J.T. and Wilcoxon, F. 1949 A simple method of evaluating dose effects experiments. *Pharmacol. Exp. Ther.* 96 : 99-113.

Merian, E. 1991. Metals and their compounds in the Environment. Occurrence, Analysis and Biological Relevance. VCH:Weinheim

Naeem, M., Salam, A., Narejo, N. T., Khokhar, M.Y., Yar, R.A. and Ishtiaq, A. 2012. Heavy Metal Detection in *Mystus Bleekeri* as Bioindicator and Potential Risk of Human Health. *Sindh Univ. Res. Jour. (Sci. Ser.)* 44 (2) : 189-194.

Sadeghi and Imanpoor, 2015. Acute toxicity of Mercuric Chloride ($HgCl_2$), Lead Chloride ($PbCl_2$) and Zinc Sulfate ($ZnSO_4$) on Silver Dollar Fish (*Metynnis fasciatus*). 9(29). Summer 2015

Suter, M. 1944. New records of fish from Poona. *Journal of the Bombay Natural History Society*. 44 : 408-414.

Van der Oost, R., Beyer, J. and Vermeulen, N.P.E. 2003. Fish bioaccumulation and biomarkers in environmental risk assessment: A review. *Environ. Toxicol. Pharmacol.* 13 : 57-149.

Wagh, G. K. and Ghate, H.V. 2003. Freshwater fish fauna of the rivers Mula and Mutha Pune, Maharashtra. *Zoos' Print Journal.* 18 (1) : 977-981.