E-ISSN: 2347-5129
P-ISSN: 2394-0506
(ICV-Poland) Impact Value: 5.62
(GIF) Impact Factor: 0.549
IJFAS 2018; 6(6): 180-182

www.fisheriesjournal.com
Received: 12-09-2018
Accepted: 13-10-2018

Arya PD
Research Scholar, Post Graduate Research Department of Zoology, St. Albert's College, Ernakulam, Kochi, Kerala, India

Dr. Joseph ML
Associate Professor, St Alber'ts College Autonomous, Ernakulam, Kerala, India

Dr. Angel Mathew
Associate Professor, Maharajas College, Ernakulam, Kerala, India

Correspondence
Arya PD
Research Scholar, Post Graduate Research Department of Zoology, St. Albert's College, Ernakulam, Kochi, Kerala, India

Determination of lc50 of lead acetate for a fish *Oreochromis mossambicus* (Peters)

Arya PD, Dr. Joseph ML and Dr. Angel Mathew

Abstract
The contamination of water by heavy metal is a serious problem to the aquatic organisms. The present study was conducted to evaluate the 96 hr LC50 value of Lead acetate for the fish *Oreochromis mossambicus* .The acute toxicity test was performed according to the standard methods in APHA and the values calculated by probit analysis. The fish specimens were acclimatized in the laboratory conditions for 15 days. The average weight and length of fish used in the present investigation were 25-30 gm and 13-16 cm, respectively. The five groups of fishes were exposed to the wide range of lead acetate with different concentrations of 10, 15, 20, 25 and 30mg/L. All the exposed fishes were daily observed and dead fishes were removed immediately. The mortality was recorded on daily basis. The LC50 value at 96 hr was found to be 17.33mg/L to *Oreochromis mossambicus*. The susceptibility of *Oreochromis mossambicus* to the lethal effect of Lead acetate was dependent on duration as well as on concentration.

Keywords: Lead acetate, a cute toxicity, *Oreochromis mossambicus*, 96 hr LC50

1. Introduction
Aquatic toxicology is the study of the effects of chemicals and other toxic agents on aquatic organisms with special emphasis on adverse or harmful effects. A toxicant is an agent that can produce an adverse response in an organism, seriously damaging its structure or function and resulting in death [1]. A pollutant or foreign substance may be introduced deliberately or accidently in to the aquatic ecosystem, ruin the quality of the water and making it adverse for aquatic life. Toxicity is a relative property of chemicals to have a harmful effect on a living organism. Toxicity tests are therefore, used to evaluate the unfavourable effects of a chemical on living organisms under standardized, reproducible conditions that permit comparison of similar data from different laboratories.

Heavy metal pollution is one of the most critical environmental problems today. Modern industries are to a large extent responsible for contamination of the environment [2, 3]. Heavy metals are constant contaminants in the environment causing serious illness in fish, animals and human. Heavy metals are being introduced into the environment through industrial processes, sewage disposal, soil leaching and rainfall. Various effluents and related toxic substances present in the aquatic environment constantly affect the healthy growth of living organisms, mostly fishes of economic importance. Almost all types of heavy metals are present in the aquatic environment and fishes are extremely sensitive to some of these metals [4]. Heavy metal pollutants cause massive fish kill and destruction of other aquatic life. Aquatic pollution is still a problem in many freshwater and marine environments as it causes negative effects for health of the respective organisms [5, 6, 7, 8].

Lead is a naturally occurring metal found in small amounts in the earth crust. It can be found in all parts of our environment. Based on the studies of Department of health and services [DHHS] Lead acetate and Lead phosphate may reasonably be anticipated to carcinogens. Lead represents the main toxic elements in nature. However, most lead concentrations that are found in the environment are results of human activities. Lead (Pb) is one of the ubiquitous and toxic elements in aquatic environment. Considering that Lead toxicity is currently one of the serious problems worldwide, there is still no specific, reliable and safe treatment [9].

Impact of contaminants on aquatic ecosystems can be evaluated by using fishes [10]. Fishes are considered as one of the most significant indicators in freshwater systems for the evaluation of environmental pollution [11, 12, 13]. *Oreochromis mossambicus* is a commercial fish and widely used for food, it is seen in fresh water as well as in brackish water.

It has comparatively high resistance and hence *Oreochromis mossambicus* is used as experimental model.

2. Materials and methods

Oreochromis mossambicus was purchased from a hatchery at Murikkumpadam, Kerala average weight of 25-30gm, length 13-16 cm. The fishes were acclimatized to laboratory conditions in dechlorinated tap water for 15 days in an aquarium tank of 50 litre capacity equipped with filters and aerators. The water was changed after every 24 hours. The fishes were fed with artificial feed equal to 1/10th of their body weight. Unconsumed food and faecal wastes were siphoned off daily. The dead fish was immediately removed from the test tanks. The fishes were exposed to 10, 15, 20, 25, and 30 mg/l of Lead acetate for 96 hours.

Toxicity test have been performed in accordance with the standard methods given in APHA [14]. The stock solution of Lead acetate was freshly prepared which was renewed after every 24 hours.

3. Results and Discussion

From the present investigation the 96 hr LC50 of Lead acetate for the fish *Oreochromis mossambicus* was found to be 17.33mg/l. The relation between percentage mortality and concentration of Lead acetate are shown in (Table 1) by Finney's Probit analysis method and SPSS Statistical Software. Figure 1 shows the regression line between the log concentration of Lead acetate and probit kill of *Oreochromis mossambicus*.

Table 1: Relationship between concentration of lead acetate and percentage of mortality of fish

S. No.	Concentration in ppm	Log concentration	No. of Fishes exposed	No. of Fishes died at 96hr	Percentage mortality	Probitmortality
1	10	1.0000	10	1	10.00	3.718
2	15	1.1761	10	3	30.00	4.476
3	20	1.3010	10	5	50.00	5.000
4	25	1.3979	10	8	80.00	5.842
5	30	1.4771	10	10	100.00	-

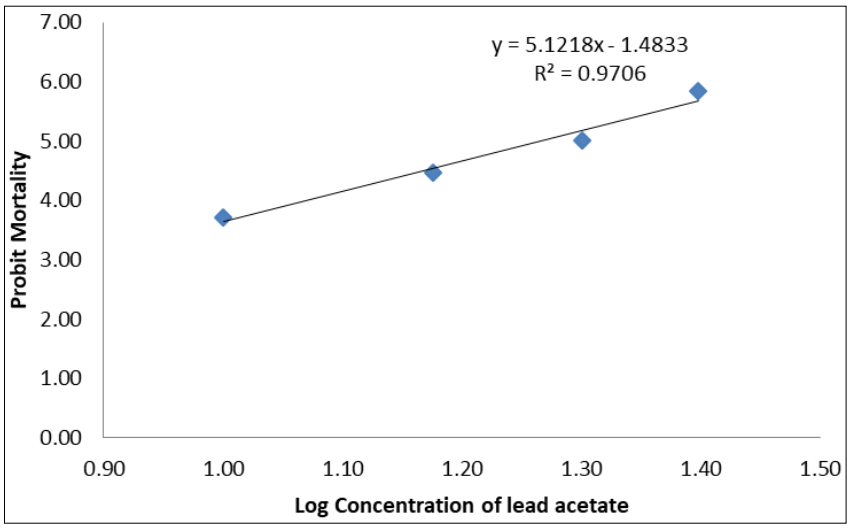

Fig 1: Graphical representation of probit mortality vs Log concentration

In earlier studies LC50 value of lead acetate for *Oreochromis mossambicus* is 20.03 mg/l [15], 18.7mg/l [16]. Different values of the same heavy metal for the same fish species were found. This may be due to the differences in age, feeding habit, sex and also experimental conditions [17, 18]. Following are the similar observations recorded by different investigators experimented with different metals and different fish species - 96 hr LC50 value of *Clarias gariepinus* for lead acetate is 122mg/l [19], and for the fish *Arassius auratus gibelio* is 29.07mg/l [20]; 96-hr LC50 values of Lead Nitrate for certain fishes are - *Oreochromis niloticus* 44mg/ml [21], *Labeo rohita* 34.20 mg/l [22], *Panguine hypophthalmus* 48.06mg/l and *Ciprinus carpio* 77.33 mg/l [23]; In *Anabas testudines* LC50 value of Lead chloride (pbcl2) was found to be 1.051mg/l [24]. The 24, 48, 72 and 96 hours LC50 values of Nickel in the fish *Oreochromos mossambicus* were reported as 131.78, 84.58, 58.19 and 51.39 ppm respectively. For Cadmium the 24, 48, 72 and 96 h LC50 values were recorded 151.91, 121.36, 106.88 and 96.57 ppm respectively [27]. The behavioural changes and mortality rate of *Oreochromis mossambicus* during the present experiment was found to depend on both duration of exposure and increase in concentration of the toxicant.

The mortality was found to be increasing with increase in exposure time. During the exposure, though fishes could withstand the effect of toxicants in the initial period of exposure, they were found succumbing to the toxic effect as the exposure time prolonged. The mortality rate was found to be directly proportional to the dose of heavy metal.

4. Conclusion

It is concluded that some organisms are sensitive to heavy metals in the aquatic ecosystem and that cause deleterious effects to them. Fishes are more frequently exposed to these pollutants because it is believed that regardless of where the pollution occurs, it will eventually end up in the aquatic environment. The LC50 value of Lead acetate was appeared as 17.33mg/L. Toxicity studies helps to determine possible limit of a toxicant in an ecosystem and helps to propose policies to protect the aquatic system.

5. References

1 Chavan VR, Muley DV. Effect of heavy metals on liver and gill of fish *Cirrhinus mrigala* International Journal of Current Microbiology and Applied Sciences. 2014; 3(5):277-288.

2 Shukla Vineeta, Monika Dhankhar, Jai Prakash, Sastry KV. Bioaccumulation of Zn, Cu and Cd in *Channa punctatus*. Journal of Environmental Biology. 2007; 28:395-397.

3 Gupta Pallavi, Neera Srivastava. Effects of sub-lethal concentrations of zinc on histological changes and bioaccumulation of zinc by kidney of fish, *Channa punctatus* (*Bloch*). Journal of Environmental Biology 2006; 27:211-215.

4 Ali Muhammad, Yousafzai Farhad, Ullah Fathul Bari, Sumayya Raziq, Mehreen Riaz, Khalid Khan et al. Bioaccumulation of Some Heavy Metals: Analysis and Comparison of *Cyprinus carpio* and *Labeo rohita* from Sardaryab, Khyber Pakhtunkhwa Biomed Research Int**er**national, 2017, 580-590.

5 Khallaf EA, Galal M, Authman M. The biology of *Oreochromis niloticus* in a polluted canal, Ecotoxicology. 2003; 12:405-416.

6 Filho OEC, Lopes RM, Paumgartten FJR. Comparative study on the susceptibility of freshwater species to copper-based pesticides, Chemosphere. 2004; 56:369-374.

7 Shaw BJ, Handy RD. Dietary copper exposure and recovery in Nile tilapia, *Oreochromis niloticus*, Aquatic Toxicology. 2006; 76:111-121.

8 Sunisa Sirimongkolvorakul, Tawewan Tansatit, Narin Preyavichyapugde, Piya Kosai1, Kanitta Jiraungkoorskul, Wannee Jiraungkoorskul. Efficiency of *Moringa oleifera* dietary supplement reducing lead toxicity in *Puntius altus*. Journal of Medicinal Plants Research. 2012; 6(2):187-194.

9 Barhoumi S, Messaoudi I, Gagne F, Kerkeni A. Spatial and seasonal Variability of some biomarkers in *Salaria basilisca* (Pisces: Blennidae): Implication for biomonitoring in Tunisian coasts, Ecological Indicators. 2012; 14(1):222-228.

10 Begum G. Carbofuran insecticide induced biochemical alterations in liver and muscle tissues of the fish *Clarias batrachus* (linn) and recovery response. Aquatic Toxicology. 2004; 66:83-92.

11 Farombi EO, Adelowo OA, Ajimoko YR. Biomarkers of oxidative stress and heavy metal levels as indicators of environmental pollution in African Cat fish (*Clarias gariepinus*) from Nigeria Ogun River. International Journal of Environmental. Research and Public Health. 2007; 4:158-165.

12 Aruldoss Indra K, Sankar Samipillai. Impact of Lead and Influence of Different Feeds on Carbohydrate Metabolism in the Muscle Tissue of Fresh Water Fish, *Oreochromis mossambicus* (Peters). International Journal of Modern Research and Reviews. 2014; 2(1):47-51.

13 Jiraungkoorskul, Upatham ES, Kruatrachue M, Sahaphong, Vichasri Grams S, Pokethitiyook S. Histopathological effects of glyphosate herbicide,on Nile Tilapia. Science Asia. 2002; 28:121-127.

14 APHA. Standard methods for estimation water and waste water, 22nd edition. American Public Health association. Washington D.C, 2012.

15 Meena R, Dr. Chandrakala N, Indra N. Studies on the bioaccumulation of lead in *Oreochromis mossambicus* during short term toxicity. International Journal of Applied Research. 2017; 3(1):468-470.

16 Latif A, Ali M, Sayyed AH, Iqbal F, Usman K, Rauf M, Kaoser R. Effect of copper sulphate and lead nitrate, administered alone or in combination, on the histology of liver and kidney of *Labeo rohita*, Pakistan Journal of Zoology. 2013; 45(4):913-920.

17 Witeska M, Jezierska B, Chaber J. The influence of cadmium on common carp embryos and larvae, Aquaculture. 1993; 129:129-132.

18 Elora Parvin, Kawser MD, Ahamed MD, Monirul Eslam, Mosammat Salma Akthar, Alamgir Kabir. Priliminary acute toxicity bio assays of lead and cadmium on fresh water climbing perch *Anabas testudineus*, Terrestrial and aquatic environmental toxicology global science books, 2011.

19 Hmoud Fares Alkahemal-Balawi, Zubair Ahmad, Ali Suliman Al-Akel, Fahad Al-Misned, ElAmin Mohamad Suliman, Khalid Abdullah Al-Ghanim D. Toxicity bioassay of lead acetate and effects of its sublethal exposure on growth, haematological parameters and reproduction in *Clarias gariepinus*. African Journal of Biotechnology. 2011; 10(53):11039-11047.

20 Khan SA, Liu X, Shah BR. Impact of Acute Toxicity of Lead Acetate on The Level of Essential Trace Metals And Histopathological Changes In Crucian Carp. (*Carassius Auratus Gibelio*) The Journal of Animal & Plant Sciences. 2014; 24(5):1405-1414.

21 Asim Ullah, Hameedur Rehman, Alam Zeb Khan, Ziafat Rehman, Saeed Ahmad, Mujaddadur Rehman et al. Determination of 96-Hr LC50 of Lead Nitrate for a Fish, *Oreochromis niloticus*, Journal of Entomology and Zoology Studies. 2016; 4(4):1216-1218.

22 Brraich Onkar Singh, Kaur Manjeet. Determination of LC50 of Lead Nitrate for a fish, *Labeo rohita* (Hamilton-Buchanan) International Research Journal of Biological Sciences. 2015; 4(8):23-26.

23 Sobha K, Poornima, Al Harini, Veeraiah. A Study On Biochemical Changes In The Fresh Water Fish, Catla Catla (*Hamilton*) Exposed To The Heavy Metal Toxicant Cadmium Chloride, Kathmandu University Journal of Science, Engineering and Technology. 2007; 1(4).

24 Zeynab Abedi, Mohammadkazem Khalesi, Sohrab Kohestan Eskandari, Hossein Rahmani. Comparison of Lethal Concentrations (LC50-96 H) of Cdcl2, Crcl3, and Pb (NO3)2 in Common Carp (*Cyprinus carpio*) and Sutchi Catfish (*Pangasius Hypophthalmus*) Iranian Journal of Toxicology. 2012; 6(18).

25 Kiran BR, Shashi Shekhar TR, Puttaiah ET, Shivaraj Y. Trace metal levels in the organs of Finfish *Oreochromis mossambicus* (Peter) and relevant water of Jannapura lake, India. Journal Environmental. Science & Engineering. 2006; 48(1):15-2.

26 Pandari Reddy P, Jagadeshwarlu R, Sunitha Devi G. Determination of lethal concentration (LC50) of copper to *Sarotherodon mossambica*. International Journal of Fisheries and Aquatic Studies. 2016; 4(1):172-175.

27 Dorey Benjamin AJ. Thatheyus Acute Toxicity of Nickel and Cadmium to the Cichlid Fish, *Oreochromis mossambicus* (Peters) Research in Zoology. 2012; 2(4):19-22.