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DETERMINATION OF LC50 OF FRESHWATER FISH, (*TILIPIA MOSSAMBICUS*) WHEN EXPOSED IN ZINC

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Abstract: The fishes were exposed in different concentration of zinc for different time intervals to study of lethal toxicity of zinc. The lethal concentration prepared from the stock solution (0.2mg,0.4mg/lit, 0.6mg/lit & 0.8mg/lit respectively).the fishes was exposed in 0.2, 0.4, 0.6 & 0.8mg/lit for 24 hrs, 48 hrs, 72 hrs and 96 hrs. The highest mortality was observed in 48 hrs followed by 96 hrs. The LC50 value was 0.190 mg/lit for 72 hrs.Consequently we observed and record all morphological & behavioral changes after each successive time intervals.

***Index Terms* - Zinc, *Tilapia mossambicus*, lethal Concentration, morphological behavioral changes.**

I. Introduction

Fish living in metal polluted environments might either be exposed to metals through the food chain, or via direct uptake from contaminated water. The gills are the first organs to suffer from this kind of pollution and will show the first clinical signs induced by waterborne metal exposure Guo et. al. (2018). Copper and zinc are essential nutrients for fish and therefore dietary or waterborne intake of these elements is necessary to sustain basic metabolic processes, in contrast to xenobiotic metals such as cadmium Wood et. al. (2012). However, elevated concentrations of zinc will also lead to adverse effects on a wide range of crucial pathway. Prolonged elevated zinc uptake will eventually lead to critically high zinc accumulation in tissues where it can generate damaging reactive oxygen species Loro et. al. (2012). Pollution of the aquatic environment with heavy metals has become a serious health concern in recent years. These metals are introduced into the aquatic ecosystem through various routes such as industrial effluents and wastes, agricultural pesticide runoff, domestic garbage dumps and mining activities (Merian 1991). 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).

Zinc (Zn) is one of the most important trace metals in the body, and participates in the biological function of several proteins and enzymes (Maity et. al. 2008). Despite being an essential trace element, Zn is toxic to most organisms above certain concentrations (Ho, 2004). Since the range-finding acute test is conducted to pinpoint exposure concentrations; the definitive acute test is firstly conducted to estimate LC50 of the chemical to which organisms are exposed (Rand, 2008). Several fishes are used as test organism for toxicological studies. In the present studies freshwater fish, *Tilapia mossambicus* used as test organism for evaluation the impact of Zinc. Consequently, the objective of this study is to assess the responsiveness of *Tilapia mossambicus* to Zn through determination of acute 96 hrs LC50 value and behavioral responses induced from exposure to different Zn concentrations.

II. Material and Methods

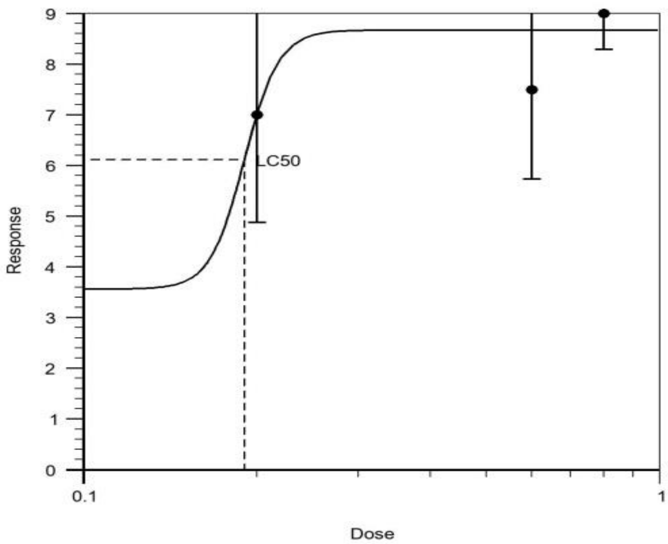
The freshwater fish, *Tilapia mossambicus* procured from Govt. fish hatchery at Nanded. Prior to the experiment, fish were acclimatized for 2 weeks in 14 40-L glass aquaria under laboratory conditions 10 fish per each aquarium. The continuous aeration was maintained in each aquarium using an electric air pumping compressors. Fish were fed daily on commercial fish diet. The heavy metal Zn in the form of zinc sulfate anhydrous was used in the present study. The acute toxicity test was performed for 4 days in which two replicates of four different Zn concentrations (0.2, 0.4, 0.6 & 0.8 mg/L) were used (10 fish for each aquarium). At 24 hrs, 48 hrs, 72 hrs and 96 hrs, fish dead were counted in the different Zn concentrations. No mortality was observed among control fish. Simultaneously we observed and record the morphological changes and mortality of fishes in each hour. Fishes was to sacrifice at each 24 hrs till the 96 hrs. Isolate the tissue like muscle, liver & kidney in distilled water for biochemical analysis and another set was used to histopathological analysis. The blood was collected directly by heart puncture and stored into two tubes. The one tubes containing EDTA as an anticoagulant for serum analysis and another for hematological parameters. The calculation of LC50 values was done by online system through the four parameters logistic equation, which corresponds to the dose-response curve with the slope of the variable slopes (AAT Bio quest Inc. (2018). Quest Graph, LC50 Calculator. https://www.aatbio.com/tools/lc50- calculator.

III. RESULTS AND DISCUSSION

In the present investigation when fresh water fish exposed in four different concentration 0.2, 0.4, 0.6 & 0.8 mg/lit for different time intervals. In the first 24 hrs (0.2mg/lit) the rate of mortality of fishes was observed 4%. The highest rate of mortality was observed in 48 hrs (0.4mg/lit -09) followed by 96 hrs (0.8mg/lit 08). The fifty (50%) percent mortality rate was observed in 72 hrs for (0.6mg/lit 05) the LC50 value was obtained 0.190 mg/lit. for 72 hrs. the results is summarized in table no.1 and graph no.2

Table no.1
Showing the rate of mortality of freshwater fish, *Tilapia mossambicus* when exposed in different concentration for different time intervals

Time	Concentration in mg/lit	Number of animal Exposed	Number of animal dead
24h	0.2	10	04
48h	0.4	10	09
72h	0.6	10	05
96h	0.8	10	08



Graph:1
Showing rate of mortality of fishes *Tilapia mossambicus* when exposed in various concentration of Zinc for different time intervals by using dose response relationship curve equation.

It is known from literature that typical 96-hr LC50 concentrations of zinc for fishes are 1 to 10 mg/lit. in soft water and 3 to 20 mg/lit. in hard water (Spear, 1981). The major modifying physico-chemical factors of Zn toxicity are hardness, and pH of water (Alabaster, Lloyd, 1980; Spear, 1981; Bradley, 1985). Acute lethality of dissolved Zn increases with decreasing water hardness and increasing pH, carbonate alkalinity having limited influence (Holcombe, Andrew, 1978; Spear, 1981; Bradley, Sprague, 1985; Cusimano et al., 1986). In the present investigation the toxicity of zinc for *Tilapia mossambicus* was 0.190 mg/lit for 72h. Similar results was observed in another studies and reported that the 96-hr LC50 values in soft water (25-44 mg/litre as CaCO3) were from 0.066 mg Zn/lit (Cusimano et al., 1986) to 0.91 mg Zn/litre (Herbert, Shurben, 1963). On the other hand, in hard water (179-350 mg/litre as CaCO3) they amounted from 2.5 (Holcombe, Andrew, 1978) to 7.21 mg Zn/lit depending on fish size and test conditions. In very hard water (500 mg/litre as CaCO3) derived 48-hr LC50 value for rainbow trout was, however, equal to 4.76 mg Zn/litre (Solbe, 1974). Derived LC50 values for other salmonid fishes such as *Salmosalar* (Sprague, 1964), *Salmoclarki* (Rabe, Sappington, 1970), *Oncorhynchusnerka* (Chapman, 1978), *Salmotrutta (*Nehring, Goettl, 1974), *Salvelinusfontinalis* (Holcombe, Andrew, 1978) completely got into the ranges for rainbow trout.

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