



EFFECT OF CADMIUM NITRATE ON ACUTE TOXICITY OF FISH CHANNA PUNCTATUS AT 48 HR. BY STATISTICAL METHOD

Dr. S.B. Jadhav

Department of Zoology and Fishery Science

Dr. S. V. Phadke*

Dayanand Science College, Latur, Shivaji Mahavidyalaya, Renapur
*Corresponding Author

ABSTRACT

This study was carried out on fish channa punctatus to investigate the lethal concentration of cadmium nitrate on fish channa punctatus at 48 hr. Experiment procedure was repeated five times at the selected cadmium nitrate concentrations, noting the number of fish killed. The mean value was taken. These values were taken to determine LC50 value for 48 hr.

KEYWORDS : Pollution, cadmium nitrate, Acute toxicity, Channa punctatus

INTRODUCTION

In general, toxicology tests are not primarily designed to demonstrate that a chemical is safe, but rather characterize the effects, a chemical can produce or not. The purpose of these tests is to provide vast data to use in risk evaluation. To define perfectly both the environmental and health hazards of the chemicals in general, variety of animal toxicological tests being conducted. The LC50 value is a measure of toxicity of a heavy metal when test animals breathe air mixed with metals dust, vapours or spray mist.

The LC50 is the concentration of metals which is lethal to 50% of a population of test animals and is usually determined for a specific exposure period. The length of exposure is significant because shorter exposure periods generally require higher metallic concentrations to produce toxic effects.

Since the toxicity for the given concentration increases with the time of exposure, However, a period of 96 hrs, exposure of test species to the test solution has been in wide use. Prior to experimentation preliminary tests were also made to fix the range for studying 50% mortality (LC50) for the different time periods. In the present study, in addition to the 96 hrs. LC50 determinations, the LC50 concentration for 24, 48, 72 and 96 hrs. have also been estimated.

MATERIAL AND METHOD :

Test fishes channa punctatus were collected from yeldari river parbhani district . After collection the fishes were acclimatized in laboratory condition at room temperature for 2-3 days. The active acclimatized fishes of approximately same size were selected for experiment.

For determination of acute toxicity the laboratory acclimatized fishes were sorted into 8 batches of 10 each. Since an increase in fish density (Number) is known to increase toxicity (Holden,1973) a constant ratio of fish biomass to water volume was maintained clean, aged dechlorinated water was used for experiments.

One day prior to the commencement of experiment, feeding was stopped water level in all aquaria was maintained same. The test fish were also not fed during bioassay test.

As susceptibility of the fish to heavy metals is known to vary with size (Height and Fingerman, 1977)

Stock solution of cadmium nitrate were prepared for bioassay tests, few concentrations from stock solution were prepared as per the dilution technique suggested by APHA(1998).

The water used for bioassay studied had hydrological parameters similar to those of the water used for maintaining the animal during acclimatization.

Pilot reading is taken for cadmium nitrate, Suitable dilution of toxicant were prepared.

1. Statistical Method :-

The method makes use of probit analysis. The percent mortalities obtained were converted to probit kills by using regression equation according to Finney (1971).

The regression equation.

$$Y = \alpha + bx.$$

RESULT

The range of concentrations used for 48hrs exposure the cadmium nitrate concentrations ranged from 0.5 to 1.1 ppm. In the test media. The mortality rates after 48 hrs. exposure were 10,20,40,60,80,90,and 100 in test concentrations of 0.5,0.6,0.7,0.8,0.9,1.0 and 1.1 ppm respectively.

By Statigcal method 48.hr. LC50 value for cadmium nitrate is 0.7743 ppm.

Table No. 1

Physico – chemical parameters of water used for Acute toxicity test.

Sr.No.	Physico – Chemical parameters	Range.
01.	PH	7.27.4
02.	Temperature (°C)	24
03.	Do (mg/l)	8.0
04.	Hardness of cacO3 (mg/l)	150
05.	Chlorides (mg/l)	172.5
06.	Salinity (g/l)	311.3

Table No 2 :- Calculation of regression equation for LC50 of cadmium nitrate to the freshwater fish channa punctatus for 48 hours. (Probit analysis by finney, D.J, 1971)

Sr. No	Conc. in ppm	Log conc. (x)	No. of animal exposed (N)	No. of Mortality (Y)	Mortality p=100 Y/N	Empirical probit	Expected probit (y)	Weight coefficient (w)	Weight w*x	Working probit (y)	WX	WY	WX ²	WY ²	WXY
1	0.5	0.6990	10	1	10	3.7884	3.7	0.35880	3.5880	3.750	2.3478	12.4017	1.6401	48.4500	0.3717
2	0.6	0.7782	10	2	20	4.1154	4.1	0.47144	4.7144	4.150	3.6807	18.0012	2.8242	81.5400	1.5283
3	0.7	0.8451	10	4	40	4.7607	4.7	0.61608	6.1608	4.767	5.2005	28.2427	4.3994	188.8200	24.7118
4	0.8	0.9031	10	8	80	5.2513	5.2	0.82972	8.2972	5.262	5.6662	32.9520	5.1166	171.0640	28.7960
5	0.9	0.9542	10	8	80	5.8418	5.8	0.92280	5.0280	5.840	4.7918	28.1588	4.5756	171.4750	28.0123
6	1.0	1.0000	10	9	90	6.2816	6.2	0.79101	3.7011	6.261	3.701	23.2961	3.7011	148.0000	23.2961
Total								28.2015			25.386	146.909	22.2603	757.5807	129.7280

$$\bar{X} = \frac{\sum wx}{\sum w} = \frac{25.386}{29.2105} = 0.8960$$

$$\bar{Y} = \frac{\sum wy}{\sum w} = \frac{146.909}{29.2105} = 5.0293$$

$$b = \frac{\sum wxy - (\bar{X} \times \sum wy)}{\sum wx^2 - (\bar{X} \times \sum wx)}$$

$$B = \frac{129.7360 - (0.8960 \times 146.909)}{22.2903 - (0.8960 \times 25.386)}$$

$$B = \frac{129.7360 - 131.6304}{22.2903 - 22.7458} \\ = 4.1589$$

Regression Equation:-

$$Y = \bar{Y} + b(X - \bar{X})$$

$$Y = 5.0293 + 4.1589(X - 0.8960)$$

$$Y = 5.0293 + 4.1589 - 3.7263$$

$$Y = 4.1589X + 1.303$$

$$Y = 5, X = ?$$

$$5 = 4.1589X + 1.303$$

$$5 - 1.303 = 4.1589x$$

$$= \frac{3.697}{4.1589}$$

Anti log of X = 0.8889

LC50 For 48 hours = 0.7743 ppm.

DISCUSSION :-

The results of present study show that LC50 value for heavy metal cadmium nitrate on fish *channa punctatus* at 48 hrs. by statistical method i.e probit analysis by finney, D.J. 1971 is 0.7743 Ppm.

The Lc50 value of 96 hrs. of aluminium found to be 56.92 PPM in *Brachydaniorerio*. (Anandan and Hemalatha, 2008) and the lethal concentration of 96 hr. value of aluminium chloride was reported as 53.1 PPM for *Catla Catla* (Maharajan and Parurukmani, 2012) which results indicates were higher than present investigation.

Shahaimi Othman, et al (2010) studies on copper and cadmium to freshwater fishes and observed that the LC50 for 24, 48, 72 and 96 hours for cu were 54.2, 30.3, 18.9, and 5.6 ug/L and for cd 1440.2, 459.3, 392.3 and 101.6 ug/L. respectively.

For *P. reticulata* LC50 for 24, 48, 72 and 96 hours for cu were 348.9, 61.3 and 37.9 ug/L. and for cd 8205.6, 2827.1, 405.8 and 168.1 ug/L, respectively. Results indicated that the cu was more toxic than cd to both fishes (cu > cd) and *R. Sumatrana* was more sensitive than *p. reticulata* to the metals.

CONCLUSION :-

The present investigation is aimed to an understand the toxicity of heavy metals cadmium nitrate on fresh water fish, *channa punctatus*.

The above results revealed that, heavy metals become toxic even at lower concentrations.

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