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Original Research Paper

Zoology

"EFFECT OF COPPER ACETATE ON ACUTE TOXICITY OF FISH CHANNA PUNCTATUS AT 48 HR BY DRAGSTEDT AND BEHREN'S METHOD "

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ABSTRACT

This study was carried out on fish channa punctatus to investigate the lethal concentration of copper acetate on fish channa punctatus at 48 hr. Experiment procedure was repeated five times at the selected copper acetate concentrations, noting the number of fish killed. The mean values was taken. These values was taken to determine LC50 value for 48 hr. By Dragstedt and Behrens Method

KEYWORDS : Pollution, copper acetate, Acute toxicity, Channa Punctatus.

INTRODUCTION

The major objectives of aquatic toxicological studies in laboratory are to identify mechanisms, of toxicity and to predict the safe concentration in the environment (Johnson and = Bargamann , 1983) there is a vast literature dealing with toxicity studies and excellent reviews have appeared which attempt to complete and summarized progress in the toxicity of substances to commercially aquatic organisms. The lethal and sub lethal toxicity study also occupies an important status in toxicological investigations and provides a sensitive tool for evaluation impact of pollution on aquatic life.

Particular attention should be given to heavy metals due to their persistence in nature (Leach et. al, 1985), incorporation into the food chain (Broman et. at. 1992), in certain concentrations (Travis and Frey, 1990). Heavy metals include both essential elements and metal with with no known biological function, such as Cd, Hg, Ag, Sn, etc. In shallow, near shore waters where dispersion and dilution processes are less effective, the measured concentrations of heavy metals are generally noticeably higher than in open ocean waters.

Chemical analyses determine the concentrations and nature of pollution, but they do not provide information on the deleterious effects upon living organisms (Chapman et. al. 1987)

MATERIAL AND METHOD

For the determination of acute toxicity, the laboratory acclimatized, fishes were sorted into 8 batehes of 10 each. A constant ratio of fish biomass to water volume was maintained clean, aged and de-chlorinated water was used for experiments.

Water level in all the aquaria was maintained same. The test fish were also not fed during bioassay test to avoid any change in the toxicity. Stock solution of copper acetate were prepared. For bioassay tests, few concentrations from stock solution were prepared as per the dilution technique suggested by APHA (1998).

Preliminary experiments using different concentrations of copper acetate was conducted to find concentration that resulted in 0-100% mortality i.e LC50 and LC100. After conducting such few initial test range finding experiments i.e Pilot reading, suitable dilution toxicant were prepared.

DRAGSTEDT AND BEHREN'S METHOD

The log application was made in Dragstedt and Behrens method (1975). In this method, cumulative mortality was determined at different concentrations of heavy metals and percent mortalities were calculated from the cumulative mortality values. LC_{50} values were calculated by adopting the following formula :

$$X \text{ Log}_2 \text{Log } LC_{50} = \text{Log } A + \frac{50-a}{b-a}$$

Where,

A = concentration of the heavy metals having the percentage of mortality below 50%

a = percentage of mortality immediately below 50%

b = percentage of mortality immediately above 50 %

LC_{50} = Antilog of log LC_{50} value.

RESULT

In 48 hours exposure, the kills scored at 1.6, 1.8, 2.0 2.2, 2.4, and 2.6 PPm of the copper acetate were 10, 20, 50, 70, 90 and 100% respectively.

By Dragstedt and Behrens method LC_{50} at 48 hr. for metal copper acetate on fish channa punctatus the value is 2.132 ppm.

Table No. 1 Physico – chemical parameter of water used for Acute toxicity test.

Sr.No	Physico – Chemical Parameters	Range
1.	PH	7.2 + 7.4
2.	Temperature (C0)	24+ 4
3.	Do (mg/l)	8.0 + 3.0
4.	Hardness of CaCo3 (mg/l)	150 + 20
5.	Chlorides (mg/l)	172.5 + 0.8
6.	Salinity (g/l)	3113+ 0.7

TABLE NO. 2 Showing Absolute and cumulative mortalities at 48 hr of fish channa punctatus exposed to copper acetate (Dragstedt and Behren's method 1975.

S.r No	Con. (im PPm)	Log Conc.	Fish Exposed	Absolute mortality		Cumulative mortality		%kill	Probit Kill	Cumulative mortality
1	1.0	1.0000	10	Live	Dead	Live	Dead	00	00	00
				10	10	56	00			
2	1.2	0.0792	10	10	00	46	00	00	00	00
3	1.4	0.1461	10	10	00	36	00	00	00	00
4	1.6	0.2041	10	09	01	26	01	3.70	3.70	3.72
5	1.8	0.2553	10	08	02	17	03	15.00	15.00	4.16
6	2.0	0.3010	10	05	05	09	08	47.05	47.45	5.00
7	2.2	0.3424	10	03	07	04	15	78.94	78.94	5.52
8	2.4	0.3802	10	01	09	01	24	96.00	96.00	6.28
9	2.6	0.4150	10	00	10	00	34	100.00	100.00	8.09

$$\text{Log}_{50} = \log A + \frac{50 - a}{b\text{-}a} \times \log 2$$

$$= 2.0 + \frac{50 - 47.05}{74.90 - 47.05} \times 0.31010$$

$$= 2.0 + \frac{2.95}{31.89} \times 0.3010$$

$$= 0.3010 + 0.0925 \times 0.3010$$

$$= 0.3010 + 0.0278$$

$$\text{Anti log of} = 0.3288$$

$$LC_{50} = 2.132 \text{ PPm}$$

DISCUSSION

Suganthi, et. at (2015) Studies on toxicological effect of cobalt chloride on freshwater fish oreochromis mossambicus and reported that the cobalt chloride exposure with high intervals of concentrations(50, 100, 200, 300, 400, 500, and 600 ppm). Showed mortality between 300-400 ppm. In confirmatory studies, the lethal concentration (LC_{50}, 96 hrs). of cobalt chloride in o. mossambicus fishes were attained at 340 ppm. in three replicates respectively.

Shelke and wani (2015) working on comparative toxicity study of heavy metals $HGcl_2$, AS_2O_3 and $CDCL_2$ to fresh water teleost fish, Amblypharyn godonmola and observed that the LC50 values for 24 and 96 hours were calculated $Hgcl_2$ reported 2.0253 and 0.1941 ppm. Values respectively. The LC_{50} values for AS_2O_3 were 1.9418 and 0.9543 ppm respectively, the LC_{50} values for $CdCl_2$ was 5.1970 and 3.1109 ppm respectively. They concluded that it is quite clear that the Amblypharyn godonmola is more sensitive to the tested heavy metal mercuric chloride.

According to the toxicity of these heavy metals to the fishes, they can be arranged as $Hgcl_2 > AS_2O_3 > CdCl_2$.

Borhan Mansouri, et. al. (2015) studies on effects of cobalt oxide nanoparticles and cobalt ions on gill histopathology of zebra fish (Daniorerio) and reported that LC_{50} for cobalt ions and cobalt oxide NP_3 for zebrafish in 96 hours was > 100 mg L^{-1} more ever, results of this study indicated no mortality during experimental period in control group. According to aquatic hazard classification of USEPA, if the LC_{50} of a chemical be higher than 100 mg L^{-1} it don't have acute toxicity but may cause long lasting harmful effects to aquatic life (EPA 200).

CONCLUSTION

LC_{50} value decreased with increase in exposure period suggesting that with increase in duration of exposure the heavy metals become toxic even at lower concentration.

The toxicity of heavy metals it may be depends upon the does and time of exposure period.

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