

Effect of Lethal and Sub Lethal Concentration of Copper Sulphate on Oxygen Consumption of Freshwater Fish *Channa punctatus*

Pravin S. Shete

Dept. of Zoology

Maharashtra Udaygiri Mahavidyalaya Udgir.

pravinssshete@hotmail.com

Abstract:

Dissolved Oxygen (DO) is one of the most important factors for aquatic animals as especially for those who derive dissolved oxygen from the water. DO levels indicate the quality of water. Many biotic and abiotic factors may influence DO concentration like mixing of different water bodies, upwelling, atmospheric exchange, respiration, photosynthesis, ice cover, pollution and some physical factors like salinity and temperature. In the present investigation the effect of lethal and sub lethal concentration of copper sulphate has been studied on the rate of oxygen consumption of freshwater fish Channa punctatus. The effect of metal was observed after 24,48,72 and 96 hours of exposure present study show that heavy metal fishes copper sulphate treated animals exhibit decrease in rate of oxygen consumption.

Keyword: oxygen consumption, copper sulphate, Channa punctatus.

Introduction :

Oxygen is necessary to provide energy for life processes low availability of oxygen imposes limits on distribution and survival of animals. Respiration is a process during which the organism obtain oxygen from external medium and use it for the purpose of energy release during oxidative metabolism. The rate of oxygen consumption determined under various experimental conditions is a good index of the metabolic capacity of an organism to face environmental stresses.

Among the heavy metal Mercury, cadmium and lead are mostly non-essential element. Whereas ferrous copper manganese and zinc are essential elements these essential elements are required in trace amount to all forms of life but hazard occurs when present in excess causing disturbances in normal metabolism in aquatic and terrestrial organism much disturbance in metabolism result into death of organism.(Burton [et.al](#),1947;Alam and Lomte,1984.) Measurement of oxygen consumption has been used to determine the effect of toxicants on overall metabolism of exposed animals. (Cairns and Scheir,1964; Weiwood and Johnson,1974) Changes in oxygen consumption have been measured as a

response to toxicants. Therefore the present work was undertaken to study the lethal and sub lethal effect of copper sulphate on Oxygen consumption of freshwater fish Channa punctatus which is commonly available in Latur district.

Material and method :

The live specimens of Channa punctatus were collected from Pimpri dam and acclimatize to laboratory conditions for about two weeks. The fishes were maintained in the laboratory in glass aquarium containing tap water and the water was changed daily. Fishes of similar size were selected for experimentation. Some basic water parameters such as hardness,Ph,temperature dissolved oxygen are observed.

Healthy fish sorted in three batches i.e. batch A, batch B and batch C. Each batch having 10 fishes. A batch was considered as control. In B batch fish were exposed to lethal concentration of copper sulphate. that is 96 hours LC 50 value (1.450 p.p.m.) C batch fishes were exposed to sub lethal concentration of copper sulphate that is 1/10 of 96 hours LC 50 value (0.145 p.p.m.)

The test fish Channa punctatus were exposed to lethal and sub lethal concentration of copper sulphate for the duration of 96 hours the concentration of copper sulphate was determined after every 24 ,48, 72 and 96 hours of exposure. Simultaneously control was also measured. Oxygen

consumption of control and exposed fishes were measured by standard Winkler’s method as described by Welsh and Smith (1953).

Sitting of apparatus :

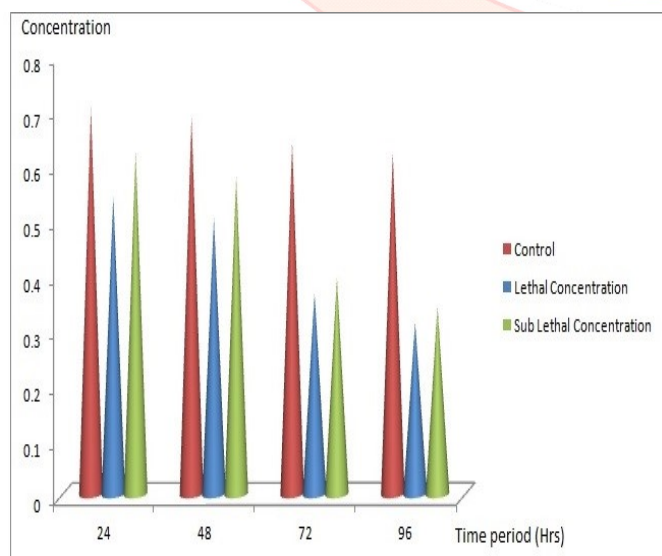
Take a fish in a big jar and pour 1000 ml of tap water slowly. It is allowed to settle for 10 minutes to facilitate them to reach a state of normality from state of excitement if any. After this equilibrium period removes on air bubbles due to handling and also to allow the fishes adjust to the darkness in the black chamber during this period.

Table -1

Sr.No.	Exposure Periods	Control	Lethal Concentration (1.450 ppm)	Sub Lethal Concentration (0.145ppm)
1	24 Hrs	0.701 ± 0.018	0.541 ± 0.018	0.622 ± 0.012
2	48 Hrs	0.685 ± 0.017	0.501 ± 0.016	0.578 ± 0.014
3	72 Hrs	0.638 ± 0.015	0.365 ± 0.020	0.393 ± 0.019
4	96 Hrs	0.620 ± 0.013	0.312 ± 0.011	0.341 ± 0.021

Values are expressed mg/g/h of fish.

Each value is the mean of three observations (±S.D.) (+) or (-) indicates present variations over control.



Results and discussion:

In the present investigation the freshwater fish *Channa punctatus* was exposed to lethal and sub lethal concentration of copper sulphate for a period of successive interval of 24,48, 72 and 96 hours. Study reveals that the rate of oxygen consumption was increased and then there is decline in rate of oxygen consumption at lethal and sublithal level compared to control. This decline form of graphical representation indicates that a long term exposure of up to 96 hours in the pollutants causes decrease in osmotic process of the animals at cellular level resulting in reduced oxygen consumption. The decrease in the consumption of oxygen is probably the result of alterations of energy metabolism. Shembekar (1987)observed the initial increase in rate of oxygen consumption of *Lepidocehalichthys thaemalis* in acute as well as chronic exposure of copper sulphate might be due to the acceleration of oxidative metabolism.

Hence an increase in the rate of oxygen consumption in blue gill was observed following exposure to sublethal concentration of copper (O Hara,1971).Scott and Major (1972) noted reduced rate of oxygen consumption in the presence of 0.5 PPM copper. Decresed rate of oxygen uptake in *Lebistes reticulatus* was noticed by saraiva(1973) following exposure of $MgCl_2$, $Pb(NO_3)_2$ and $Cd(NO_3)_2$.Exposure of *Mystus viattatus* lithldto sublethfl concentration of copper sulphate and $ZnSO_4$ showed decrease in the rate of oxygen consumption.whilelethal to sub lethal level lowered it down very much due to greater damage of gills.(Singh and singh 1979).Rao et.al.(1982) reported that endosulfan affected respiratory mechanism in *Labeo rohita* with gradual increase in oxygen consumption when treated with a concentration below LC 50 and decrease in it as the concentration of toxicant incresed. It is evident from the obtained results that metallic pollutants exert there differential influence affecting the oxygen consumption.Present study shows that heavy metal is such as copper sulphate treated animals exhibit remarkable decrease in a rate of oxygen consumption.

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