CHLOROPYRIPHOS INTOXICATION ON OXYGEN UPTAKE IN AN AIR BREATHING FISH CLARIAS BATRACHUS

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ABSTRACT

Pollution in freshwater ecosystem has reached high level in these days particularly with reference to the use of pesticides to control pests. Indiscriminate use of these pesticides has endangered the aquatic life. The concentration of these pollutants accumulates through run-off waters in our freshwater bodies, results in harmful effects on aquatic organisms and also upsets the primary productivity.

The dissolved oxygen content of the water is probably the most common measurement of biological significance. The lower oxygen content of the water is a serious limiting factor as it restricts the distribution of animals.

Oxygen is necessary for an animal to perform its various metabolic activities. The intake of oxygen by the animal, depends upon availability in its surrounding medium. The primary cause for the high risk in aquatic system is the depletion in oxygen content. The debt in oxygen content always affects aquatic animals either altering or allowing them to adapt in the changed environment.

The measurement of oxygen uptake is a sensitive method of establishing the relative importance of various environmental changes which is reflected in metabolic rate. Amongst the various factors affecting the metabolic rate in fishes are age and body size

*Attempts have also been made to study the effect of various toxicants on the respiratory physiology of fishes. The present work elucidates the acute toxic effects of an insecticide, Chlorpyrifos on haematological parameters and rate of oxygen uptake of *Clarias batrachus*, in order to find relation with health status and metabolic activity of toxicant exposed fishes.*

KEYWORDS: *Chloropyrifos Intoxication*

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INTRODUCTION

MATERIALS AND METHODS

Live specimen of *Clarias batrachus* were procured from Dumka fish market. The fishes were acclimatized in the laboratory conditions for a week before experimentation. Care has been taken to keep the animals healthy and free from parasites. The animals were fed daily with the pieces of goat liver. The water temperature during this period was at 30-32.5°C. The animals were exposed to test concentrations of 0.01875, 0.0375, 0.0754 and 0.15 ml/l Chlorpyrifos for 96 hrs, during which the pollutant water of each concentrations were renewed afresh every 24 hours.

In the next series of experiment a rectangular acrylic box of approximately 4 litre capacity, having a small air chamber at its top to minimize gaseous exchange at the air water interface, was used (Plate-IX). Under this condition, the fish can obtain air from the small air chamber in addition to extracting oxygen from water through

gills and skin. The concentration of dissolved oxygen in water samples were determined by Wrinkler's volumetric method (Welch, 1948).

O₂ uptake in various Concentrations of Chlorpyrifos

The effect of Chlorpyrifos on the rate of oxygen uptake was measured at four different concentrations from 0.01875, 0.0375, 0.0754 and 0.15 ml/l, and a separate control was maintained in fresh aerated tap water. Fishes having almost same body weight (40-50g) were used in the present experiment in order to avoid any change in the rate of oxygen consumption due to body size. Moreover, feeding was stopped at least 24 hours before measuring the rate of oxygen uptake. The VO₂ has been expressed in ml/kg/h. Ten fishes in each experimental and control group were used and the mean values were compared. The difference of significance, if any was calculated by student's t-test at the level of 5%.

Observation

The rate of oxygen consumption in *Clarias batrachus* at different concentrations of Chlorpyrifos exposure under both the experimental conditions (access to air prevented and allowed) are summarized in Table-8. The mean value of VO₂ of control animals were 72.44 ± 1.7276 and 66.91 ± 1.5088 under access to air prevented and allowed conditions respectively (Plate-XII). A perusal of the Table-8 indicates that exposure of Chlorpyrifos causes an increase in the VO₂ but the values are not consistent. There was maximum increase in VO₂ at 0.0754 ml/l exposure of Chlorpyrifos for 96 hours (82.06 ± 1.1843 during access to air prevented condition). There is no correlation between increasing concentrations of Chlorpyrifos with VO₂. Maximum rate of oxygen consumption was observed at 0.15 ml/l Chlorpyrifos exposure in access to air allowed (72.44 ± 0.7321 , $P > 0.001$; (Plate-XII).

DISCUSSION & RESULTS

The rate of oxygen consumption in *Clarias batrachus* at different concentrations of Chlorpyrifos exposure under both the experimental conditions (access to air prevented and allowed) are summarized. The mean value of VO₂ of control animals were 72.44 ± 1.7276 and 66.91 ± 1.5088 under access to air prevented and allowed conditions respectively. There was maximum increase in VO₂ at 0.0754 ml/l exposure of Chlorpyrifos for 96 hours (82.06 ± 1.1843 during access to air prevented condition). There is no correlation between increasing concentrations of Chlorpyrifos with VO₂. Maximum rate of oxygen consumption was observed after 0.15ml/l Chlorpyrifos exposure in access to air allowed (72.44 ± 0.7321).

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Table

Effect of Acute Toxicity (96 hrs. Exposure) of Various Concentrations of Chlorpyrifos on Rate of Oxygen Uptake of *Clarias batrachus* (Linn) (30-32.5°C; $\pm$ Standard error; n = 10 in each group)

Parameters Analysed	Access to air prevented (ml/kg/hr)	Access to air allowed (ml/kg/hr)
Control	72.44 $\pm$ 1.7276	66.91 $\pm$ 1.5088
01875 ml/l Chlorpyrifos	76.62 $\pm$ 0.9390 P>0.001	62.73 $\pm$ 1.5470 P>0.001
0.0375 ml/l Chlorpyrifos	78.84 $\pm$ 0.6023 P>0.001	60.21 $\pm$ 1.3420 P>0.001
0.0754 ml/l Chlorpyrifos	82.06 $\pm$ 1.1843 P>0.001	56.75 $\pm$ 1.3640 P>0.001
0.15 ml/l Chlorpyrifos	67.95 $\pm$ 1.1843 P>0.001	72.44 $\pm$ 0.7321 P>0.001

PLATE-XI

EXPLANATION OF PLATE-XI

Diagram of the apparatus used to determine the O₂ Uptake by the fish under access to air allowed and prevented conditions.

PLATE- XII

SHOWING THE EFFECT OF VARIOUS CONCENTRATIONS OF CHLORPYRIPHOS ON THE RATE OF OXYGEN UPTAKE OF CLARIAS BATRACHUS DURING ACCESS TO AIR ALLOWED AND PREVENTED CONDITIONS

EXPLANATION OF PLATE-XII

Histograms showing the effect of various concentrations of **Chlorpyrifos** exposure for 96 hours on the rate of Oxygen uptake during access to air prevented and access to air allowed in *C. batrachus*.