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Impact of Zinc on the oxygen consumption of fresh water fish, *Labeo rohita*

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Abstract:

The rate of oxygen consumption of the fish, *Labeo rohita* is increased initially when exposed to lethal concentration of Zinc. However, concentration decreased their metabolic rate & exposed animal were also in hypoactive condition.

Key words: Zinc, oxygen consumption and *Labeo rohita.*

Introduction:

Oxygen consumption of aquatic animals is a very sensitive physiological process & therefore alteration in the respiratory activity is considered as an indicator of stress of animal exposed to heavy metals. Discharge of heavy metals into aquatic environment have created severe health hazard in aquatic organisms including man. Although their normal level are not dangerous to aquatic life and are known to be essential to sustain life activities, recent increases in aquatic agricultural development & industrialization has been considered as main source of metal in aquatic ecosystem when the toxic contamination are water born the gills are site of damage which can be easily assayed. The normal respiration area of the gills may alter due to intimate contact with the polluted water which would affect the diffusing capacity of the gills. Excessive mucosa was produced on the gills when fishes were exposed to heavy metals and this is thought to be the cause of death by suffocation.

Hence the present investigation was undertaken to study the respiratory metabolism of the fresh water fish Labeo rohita after exposure for varying period of time.

Material and Method:

The live specimens of Labeo rohita were collect from Pimpri Dam water and acclimatise 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. Approximately, animals of similar size were selected and used for experimentation. The freshwater fish Labeo rohita were subjected to lethal concentration of 2.5 ppm.

These fish weighing 45 to 50 gms were used for experimentation. Simultaneously control animals were maintained in tap water after different time period such as 24,48,72 and 96 hours. Oxygen consumption was studied using the apparatus devised by Saroja, K. (1959).

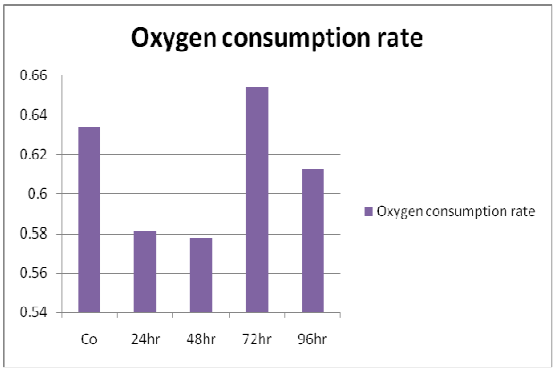
The amount of dissolved oxygen in the sample was determined by the standard Wrinkler's methods. Sugested by APHA (1998). The total unit oxygen consumption was calculated. The values are expressed as 02/mg/ltr/hrs.

Result:

Table Shows effect of Zinc on total oxygen consumption in fresh water fish, *Labeo rohita*

Sr. No.	Duration of Exposure in Hrs.	Total oxygen Consumption in CC of O_2/mg/lit./hr.
01	Control	0.6343 ± 0.024
02	24	0.5812 ± 0.032
03	48	0.5780 ± 0.013
04	72	0.6540 ± 0.026
05	96	0.6125 ± 0.011

Total oxygen consumption expressed in terms of O_2/mg/lit./hr. is the average of 6 observation ± SD.



Sr. No.	Parameters	Values
1.	Chlorides	20.35
2.	Dissolved Oxygen	6.10 mg/lit
3.	PH	8.0 ± 0.2
4.	Temperature	25 ± 2^0C
5.	Total Alkalinity	135 ± 15 mg/lit
6.	Total hardness	220 ± 20 mg/lit

The rate of oxygen consumption and total oxygen consumption of fresh water fish *Labeo rohita* has been treatment of metallic salts as Zinc.

In the present investigation it was shown that the oxygen consumption in the animals exposed to lethal concentration of Zinc oxygen consumption was gradually decreasing upto 48 hours and again slightly increased in 72 hours and finaly decreased upto 96 hours.

Discussion:

Respiration is an essential physiological activity of all living organisms. Oxygen is necessary to provide energy for living processes for carrying out all other metabolic activities. The change in rate of oxygen consumption is a good index of the metabolic capacity of an organism to face environment stress. It is evident from the result that the metallic pollutant exert it's influence affecting oxygen consumption. The alteration in the normal respiratory metabolism is due to its intimate contact with polluted water which decreases the oxygen diffusing capacity of the gill (Fenny & Berman 1976, More 1990, Nilkantha *et.al.* 1993, Ramanarao *et.al.*1996). Usharani *et.al.* (1987) have reported decrease in oxygen consumption in the fresh water teleost Tilapia mossambica an exposure to cadmium Dutt *et.al.* (1989) have reported mercuric chloride and methyl mercuric chloride have lowered oxygen consumption in cat fish, *Mystus vittatus.*

Rao *et al.*, (1982) reported that endosulfan affected respiratory mechanism in *Labeo rohita* with gradual increase in oxygen consumption when treated with concentration below LC_{50} and decrease in it as the concentration of toxicant increased. Initial stimulation subsequent decrease in oxygen consumption was supposed as an indicative that the toxicant acted as an uncoupler.

However, Fry (1957) suggested that the depressed oxygen consumption at maximum activity and unaffected swimming performance at indicated adverse effect on active metabolism of organism and was considered as an indication of damage to the tissue and vital system. The altered rate of oxygen consumption observed in the present study might also be due to the disruption of respiratory process caused by damage of gill epithelium as stated by Skidmore (1970), Eisler (1971), Burton *et al.*, (1972).

Jones, J.R.E. (1947) also reported, initial increases and subsequent decline of oxygen consumption in fish Gasterosteus aculeatus when exposed to Mercuric chloride, Zinc and Lead nitrate solution.

In the present investigation, the fresh water fish *Labeo rohita* was exposed to lethal and sub lethal concentration of Zinc for a period of successive intervals of 24, 48, 72 and 96 hours. In this experiment it was observed that the rate of oxygen consumption was increased and then there is decline in oxygen consumption rate in lethal level compared to control. The fresh water fish *Labeo rohita* exhibits decrease in rate of oxygen consumption on exposure to lethal concentration of the pollutants. This decline form of graphical representation indicated that a long term exposure up to 96 hours in the pollutants causes decrease in osmotic work of the animals at cellular level resulting in reduced oxygen consumption. Present result shows that heavy metal such as Zinc treated animal's exhibit remarkable decrease in rate of oxygen consumption.

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