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COMPARATIVE STUDY OF RESPIRATORY DISTRESS IN SOME FRESHWATER FISHES AFTER EXPOSURE TO THE PHYTOTOXIN FROM SAPINDUS LAURIFOLIUS

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Abstract: When water gets polluted the respiratory metabolism in the organisms exposed to the pollutants get affected and it will result in the low rate of oxygen consumption. In these animals under respiratory distress all life activities get affected. Freshwater fishes *Cyprinus carpio, Catla catla, Cirrhinus mrigala* and *Labeo rohita* when exposed to the phytotoxin from *Sapindus laurifolius* the rate of oxygen consumption in these fishes is observed to be decreased which results in the respiratory distress. The maximum effect on the oxygen consumption was observed on the *C. catla* and minimum effect was observed on the *C. carpio*. The phytotoxin from fruits of *S. laurifolius* is more effective in *C. Catla* and less effective in *C. carpio.*

Keywords: Phytotoxin, Oxygen consumption, Freshwater fishes

Introduction:

Oxygen is necessary for metabolic activities of animals to provide energy for life activities. Its availability imposes on distribution and survival of animals. Discharge of any pollutant into the aquatic ecosystem depletes the oxygen content and causes mortality in animals by interfering with their respiratory metabolism (Quasim and Siddqui, 1960; David and Ray, 1966 and Venkatraman, 1966). Morality is the most noticeable effect of the pollution. Sublethal effects of pollutants include changes in cellular morphology, reproduction, development, feeding, growth and behavior and that diverse fraction of assemblage of life processes collectively defined as respiration.

The oxygen consumption is a very sensitive physiological process. The change in the ecosystem due to the entry of pollutants immediately affects the oxygen consumption and the respiration in animals. The change in the respiratory activity has been used as an indicator of the stress in toxicant exposed animals. The measurement of oxygen consumption of animals, therefore, would provide additional information to the physiological mode of action of toxicants.

Material and Methods:

The freshwater fishes *C. carpio. C. catla, C. mrigala* and *L. rohita* were collected from Kishna river and fruits of *S. laurifolius* were collected from Western Ghats. The fishes of each species were exposed to plant toxin having sub lethal concentrations 175, 200, 250, 275 and 300 ppm for 2, 24, 48, 72, 96 and 120 hrs. in a separate aquaria. A control set was also maintained. The dissolved oxygen was analyzed as per Winkler`s method described by Kodarkar (1992).

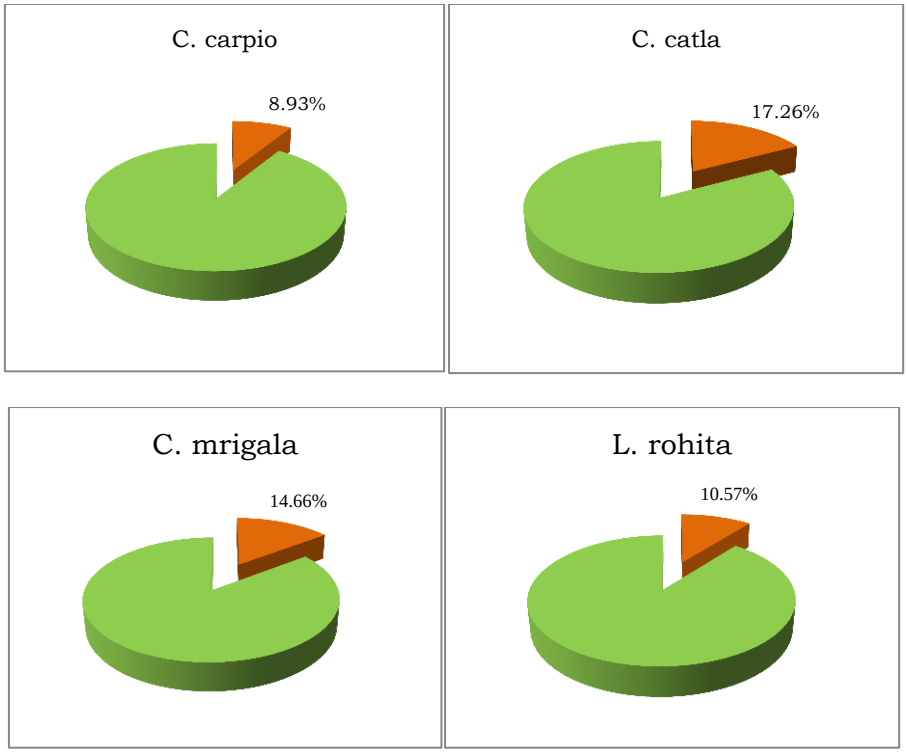
Observations:

Table-1. Effect of *S. laurifolius* on oxygen consumption of freshwater fishes (ml/gm body wt/hr/l)

Name of fish	Experimental condition	Exposure period (hrs.)					
		2	24	48	72	96	120
C. carpio	Control	0.998 ± 0.0028	0.1002 ± 0.0037	0.1003 ± 0.0009	0.1002 ± 0.0008	0.1004 ± 0.0021	0.1007 ± 0.0004
	Intoxicated	0.1024 ± 0.0010	0.0984 ± 0.0008	0.0981 ± 0.0009	0.0947 ± 0.0034	0.0931 ± 0.0005	0.0917 ± 0.0010
	Percentage	2.53	-1. 79	-2.19	-5.48	-7.27	-8.93

C. catla	Control	0.0981 ± 0.0010	0.0975 ± 0.0005	0.0979 ± 0.0011	0.0975 ± 0.0012	0.0973 ± 0.0007	0.0978 ± 0.0010
	Intoxicated	0.1106 ± 0.0018	0.0957 ± 0.0008	0.0937 ± 0.0009	0.0908 ± 0.0011	0.0867 ± 0.0007	0.0809 ± 0.0010
	Percentage	12.74	-1.85	-4.29	-6.87	-10.89	-17.28
C. mrigala	Control	0.816 ± 0.0007	0.0790 ± 0.0004	0.0818 ± 0.0008	0.0829 ± 0.0007	0.0811 ± 0.0007	0.0818 ± 0.0008
	Intoxicated	0.0818 ± 0.0010	0.0754 ± 0.0011	0.0737 ± 0.0011	0.0719 ± 0.0009	0.0705 ± 0.0007	0.0698 ± 0.0003
	Percentage	0.25	-4.56	-9.90	-13.27	-13.07	-14.67
L. rohita	Control	0.1158 ± 0.0008	0.1158 ± 0.0010	0.1152 ± 0.0011	0.1161 ± 0.0009	0.1165 ± 0.0007	0.1163 ± 0.0009
	Intoxicated	0.1211 ± 0.0031	0.1122 ± 0.0007	0.1101 ± 0.0004	0.1089 ± 0.0006	0.1079 ± 0.0010	0.1040 ± 0.0011
	Percentage	4.20	-4.84	-4.42	-6.20	-7.38	-10.57

Fig.-1. Comparative effect of *S. laurifolius* on the oxygen consumption of the freshwater fishes at 120 hrs. of exposure period.



Results and discussion:

The observations of the effect of the plant toxin *S. laurifolius* on the O_2 consumption of the fishes *C. carpio. C. catla, C. mrigala* and *L. rohita* are recorded in the Table No.1. The rate of oxygen consumption in the control set was recorded nearly constant in all the fishes for all exposure periods. The O_2 consumption in the fishes *C. carpio. C. catla, C. mrigala* and *L. rohita* in the control set ranged between, 0.0998 to 0.1007, 0.0973 to 0.0981, 0.0790 to 0.0829 and 0.1158 to 0.1165 ml/gm/hr/l, respectively from 2 hrs to 120 hrs.

Increased rate of oxygen consumption was observed in all the fishes, immediately during two hrs. exposure period to the plant toxin from *S. laurifolius*. The increase in the rate of oxygen consumption after two hrs. of exposure was 0.1024 (2.53%), 0.1106 (12.74%), 0.0818 (0.25%) and 0.1211 (4.20%) ml/gm/hr/l in the fishes *C. carpio. C. catla, C. mrigala* and *L. rohita* respectively (Table No.1).

The amount of oxygen consumed by the fishes decreased slowly after exposure of 24 hrs. the maximum decrease in the rate of oxygen consumption at the exposure period of 120 hrs, was 0.0917 (8.93%), 0.0809 (17.28%), 0.0698 (14.67%) and 0.1040 (10.57%) ml/gm/hr/l, in the fishes *C. carpio. C. catla, C. mrigala* and *L.rohita.* The comparative effect of phytotoxin *S. laurifolius* on the O2 consumption of freshwater fishes is represented by pie diagram (Fig. No.1.).

The rate of oxygen consumption in the fishes has been considered to be an indicator of intensity of metabolism (Fry,1957). It is also considered as a reflection of total metabolism in the body of organism (Murthy, 1983).

The alterations in the metabolic processes following exposure to toxic stress have always been used as an indicator of stress. In the present investigation the effect of plant toxin from the plants *S. laurifolius* on the rate of oxygen consumption of the freshwater fishes *C. carpio. C. catla, C. mrigala* and *L. rohita* has been studied. The rate of oxygen consumption was found increased during the two hrs. of exposure period in all the experimental fishes after addition of the plant toxin *S. laurifolius*. The immediate increase in the rate of oxygen consumption is in agreement with the results of Thurberg *et al.* (1977), Muley and Mane (1987) and Reddy and Venugopal (1993). They have observed increase in the rate of oxygen consumption of crustaceans, lamellibranches and crabs after exposure to the low concentration of cadmium.

The results show that the rate of oxygen consumption is decreased in all the fishes after 24 hrs. exposure to the plant toxin from *S. laurifolius*. The results also revealed that the rate of oxygen consumption is decreased slowly in all the fishes with increase in the exposure period. Similar types of results were obtained by Singh and Singh (1979) in fish *M. vittatus*, Rao *et al.* (1981) in fish *C. punctatus*, Bengeri *et al.* (1984) in fish *L. rohita*, Wagh *et al.* (1985) in *B. ticto* and Prabhakar *et al.* (1999) in *L. rohita* after exposure them to heavy metals, Penthoate, dimethyl parathion, zinc sulphate and copper and nuvan, respectively.

The Comparative data of percentage decrease of O_2 consumption in fishes *C. carpio. C. catla, C. mrigala* and *L.rohita* after exposure period of 120 hrs. was 8.93%, 17.28%, 14.66% and 10.57% respectively. This clearly indicates that the phytotoxin from *S. laurifolius* has highest effect on respiration in fish *C. catla* and lowest effect in the fish *C. carpio.* Hence it can be concluded that comparatively phytotoxin *S. laurifolius* has maximum effect on the O_2 consumption in fish *C. catla* and minimum effect in *C. carpio.*

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