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Effect of Aquathol on Biochemical Constituents of the Freshwater Cat Fish- Heteropneustes Fossilis

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Abstract: ***The present investigation has been undertaken to assess the impact of aquathol a weedicide on some biochemical parameters of a freshwater cat fish, Hetropneustes fossilis. The LC_{50}. Value for 96 hours was calculated following probit analysis method. Fishes exposed to various sublethal concentrations of aquathol (0.5 ppm, 1.0ppm, 1.5 ppm and 2.0 ppm) elicited a gradual and significant hyperglycemia with the increase of concentration as well as the increasing time-intervals, i.e. from 24 hours upto 96 hours. The liver and muscle glycogen showed decreasing trend to that of blood glucose. The anomalies in various biochemical parameters following different sublethal exposure of aquathol has been discussed.***
Keywords : Aquqthol,weedicide,Heteropneustes fossilis, hyperglycemia,liver and muscle glycogen, sublethal concentration.

I. INTRODUCTION

Pisciculture is one of the most important aspects of aquaculture.The main objective of the pisciculture rests on the high yields and nutrient values of fish. However,the aquatic weeds pose serious menace to pisciculture.The weedicides used as chemical control of weeds exert positive effects on aquatic weeds but may have adverse effects on non-target organisms. such as fishes. The indiscriminate use of weedicides has led to the contamination of water bodies, possibly affecting the health of aquatic biota. Chemical products discharged into the environment end up reaching aquatic systems, contaminating and/or affecting the aquatic biota, including fishes, through direct contact of the surface of the body and the gills of these animals with contaminated water, or else through their food. Once these products have penetrated the organism, their effect may be toxic (Erickson et al., 2008). Since the blood is the most important fluid in animals reflecting the physiological condition, the blood study is now- a- days widely used to identify the toxic impact of pollutants (Lakshmanan et.al.,2013)

II. MATERIAL AND METHOD

Weedicide , AQUATHOL [7-Oxabicyclo (2,2,1) heptane 2,3- dicarboxylic acid] in the present work was used because it was found to be quite effective against Hydrilla verticillata – a very common weed in Indian ponds .The maximum concentration of Aquathol which was selected here i.e., 2 ppm is sub-lethal concentration and below the maximum recommended dose (3 to 5 ppm) for the eradication of rooted weeds.

Heteropneustes fossilis commonly known as ‘ Singhi’ belonging to the order Cypriniformes and family Saccobranchidae was used as an experimental animal . Live and healthy spercimens were collected from local freshwater sources or from the fish market . Their average length and weight (± SD) were recorded as 34 ± 2 cm and 75 ± 4 gms respectively . Fishes were treated with 0.1 % KMNO4 solution for 2 min. to avoid any dermal infection. The fish stock was then maintained in 100 liter glass aquaria for 14 days to acclimatize under laboratory condition. The fishes were fed with pellets of wheat and ground dried shrimp (Srivastava , 1980) . The LC50 value for 96 hours of Aquathol was determined by the procedure of Finney (1971). The LC50 of aquathol for 96 hours for Heteropneustes fossilis was 6 mg/liter. Fishes were exposed to sublethal concentration (2 ppm) of aquathol, simultaneously control group was also maintained. After 96 hours of exposure to herbicides blood was collected from the cauda-dorsalis of both control and treated groups. Collection of blood : Fish was taken out of aquarium and kept in dissecting tray . The head part of the fish was covered with a piece of cloth and was caught with a very little pressure to avoid any stress on the fish . The line of lateral-line system was located and the needle of a dry 2 ml syringe ,rinsed with 3.8% solution of sodium citrate (an anticoagulant) was pierced gently into the muscle of the fish and was introduced gently into the lumen of cauda-dorsalis running just below the vertebral column keeping the syringe ventrally at an angle of 450. Blood glucose level was estimated by the modified schaffer-Hartman Titrimetric method of king et. Al. (Varley, 1976). Muscles and liver glycogen were estimated by colorimetric method of kemp et. al. (1954) .

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III. RESULTS AND DISCUSSION

Heteropneustess fossilis exposed to various sublethal concentrations of the weedicide, aquathol i.e. 0.5ppm, 1.0ppm, 1.5ppm and 2.0 ppm for different periods (24 hours, 48 hours, 72 hours and 96 hours) have exhibited varieties of anomalies in different biochemical parameters. The impacts of aquathol on the blood glucose, muscle glycogen and liver glycogen have been depicted in Table 1. The blood glucose level (mg/100 ml) exhibited a gradual and significant increase with the increasing concentration of auathol as well as the increasing times of exposure as compared to the control values. The muscle glycogen values (mg/100 mg wet weight) showed a declining trend from its control values with the increase in exposure time of H. Fossilis as well as the increasing concentrations of the weedicide, aquathol. However, the muscle glycogen values following 96 hous of exposure of aquathol although, decreased significantly but exhibited erratic trend. Liver glycogen levels (mg/ 100mg wet weight) also showed decreasing trend as compared to the control values, however, significant decrease was observed at higher concentration of aquathol (2.0 ppm) and with increasing periods of exposure. The glycogen in treated fish were found significantly reduced in both the tissues indicating the excess utilization of carbohydrate to withstand pollution induced toxicosis. The decrease in glycogen may result in impairment of carbohydrate metabolism due to toxic effect. It was observed that exposure of Heteropneustes fossilis to sublethal concentrations of Aquathol showed significant elevation in blood (Chandrasekar and Jayabalan, 1993). The carbohydrate reduction suggests the possibility of active glycogenolysis and glycolytic pathway to provide excess energy in stress condition (Reddy et al., 1993).

IV. CONCLUSION

The present work presents a number of biochemical problems in Heteropneustes fossilis evoked by Aquathol.. The biochemical alterations led to the conclusion that the weedicide Aquathol has toxic effects on the species H.fossilis, and that its presence in the environment may jeopardize the health of these animals.

Table -1 showing impact of various concentrations of Aquathal on blood glucose, muscle and liver glycogen as H. Fossilis at different hours of exposure (n = 10 animals in each group; ± SE)

Parameters	Treatment Group(PPM)	Duration of Exposure (in Hours)			
		24	48	72	96
Blood Glucose	Control 0.00	35.28±0.36	34.779±0.83	36.027±1.67	34.690±0.23
	0.5	43.316±1.46**	49.365±1.68*	49.950±0.49*	53.960±1.76*
	1	43.956±0.86**	49.257±1.13*	50.14±1.56*	56.783±1.65*
	1.5	47.886±1.49**	56.774±2.03*	60.228±2.16*	72.691±2.25*
	2	50.221±1.08**	65.964±1.87**	68.840±1.94**	90.057±2.63**
Muscle Glycogen (mg/100 mg wet weight)	0.00	0.340±0.01	0.331±0.13	0.333±0.04	0.323±0.06
	0.5	0.296±0.16	0.244±0.04*	0.211±0.08*	0.186±0.05**
	1	0.284±0.03	0.212±0.06*	0.210±0.01**	0.178±0.07**
	1.5	0.281±0.05	0.236±0.02	0.193±0.03**	0.271±0.07*
	2	0.271±0.66*	0.216±0.03*	0.186±0.08**	0.175±0.04**
Liver Glycogen (mg/100mg wet weight)	0.00	11.083	11.059	10.996	11.06
	0.5	10.443±0.38	10.208±0.08	9.843±0.12	9.253±0.16
	1	10.435±0.24	10.018±0.03	9.682±0.06	9.347±0.03
	1.5	10.273±0.08	9.998±0.07	9.497±0.02	8.397±0.05*
	2	9.891±0.04*	9.444±0.06*	8.664±0.05**	8.183±0.08**

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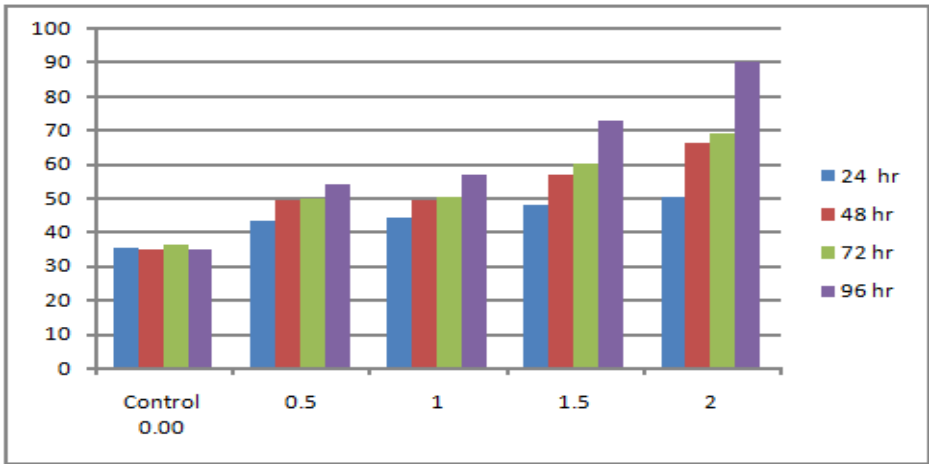
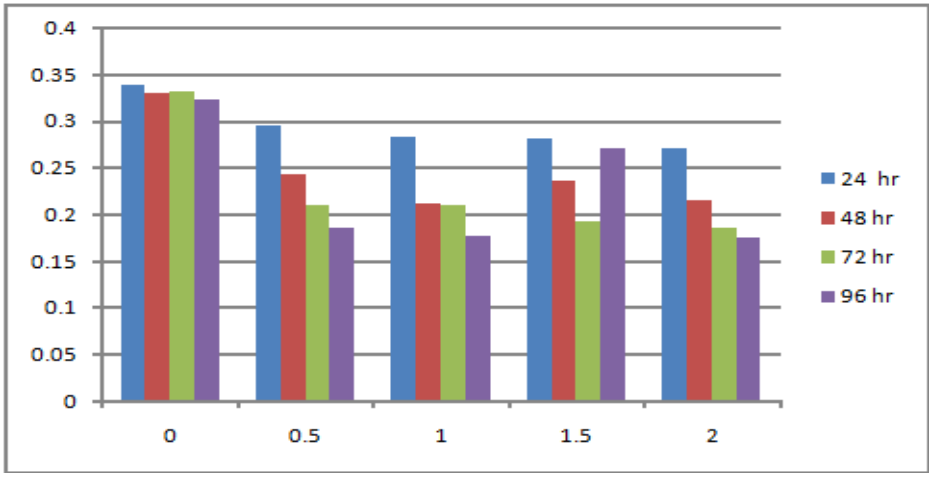
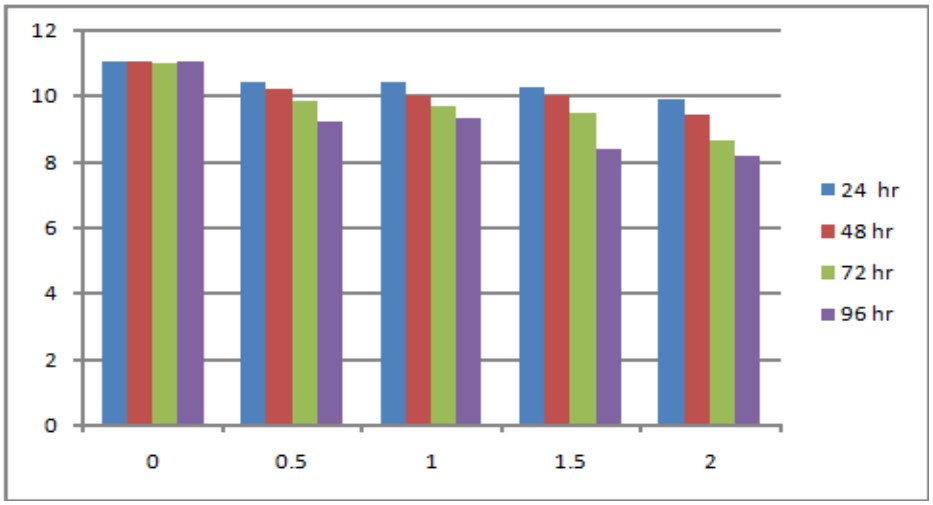
Graph -1 showing impact of various concentrations of Aquathal on blood glucose on *H. fossilis* at different hours of exposure (n = 10 animals in each group; ± SE)



Graph -2 showing impact of various concentrations of Aquathal on muscle glycogen on *H. fossilis* at different hours of exposure (n = 10 animals in each group; ± SE)



Graph-3 Showing impact of various concentrations of Aquathol on liver glycogen on *H. fossilis* at different hours of exposure (n = 10 animals in each group; ± SE)



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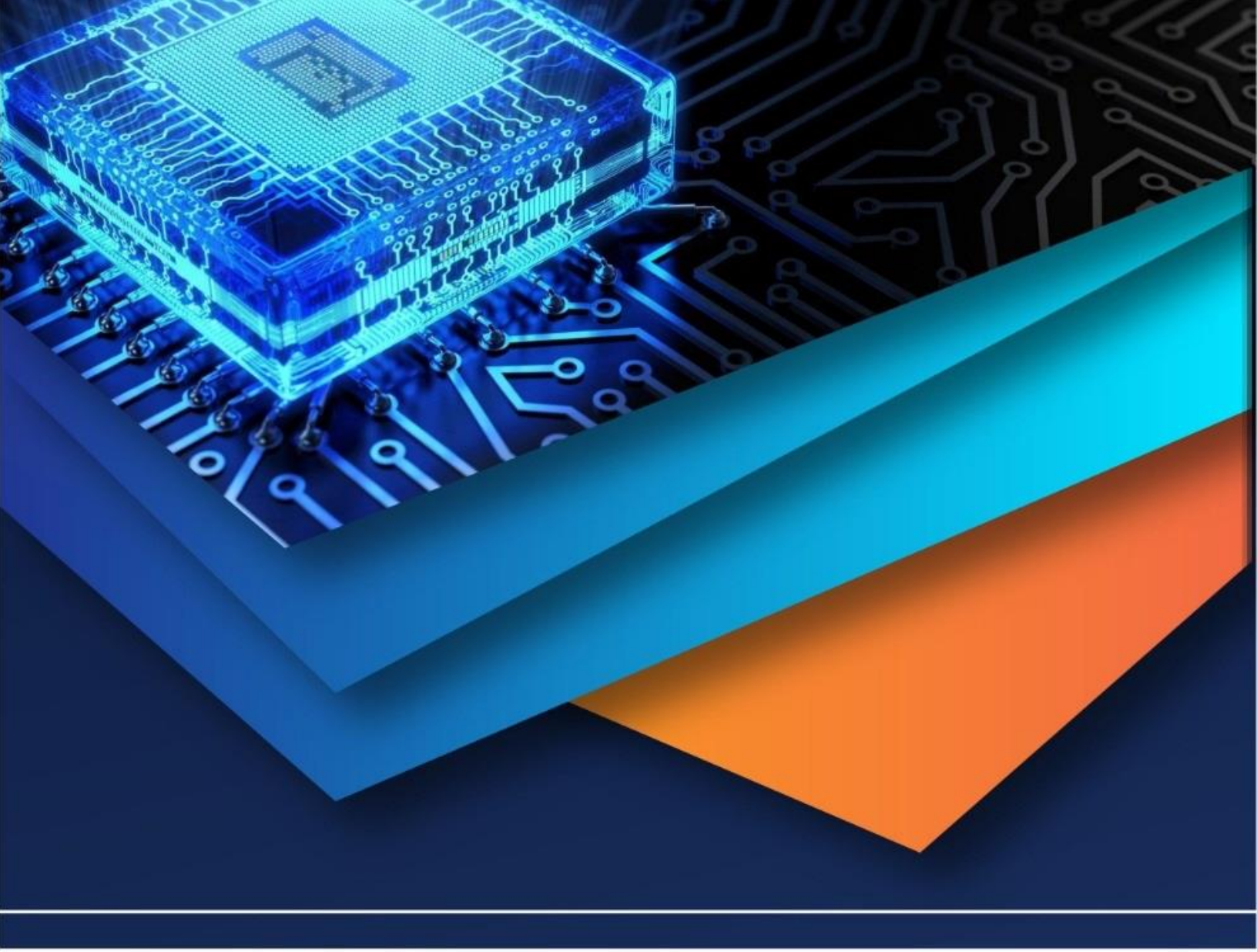

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