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EFFECT OF THIOUREA ON GROWTH AND DIGESTIVE ENZYMES ACTIVITY OF *OREOCHROMIS MOSSAMBICUS* FISH FINGERLINGS

DR. SUDESH RANI*

*Assistant Professor-II, Dept. of Zoology, M.D. University, Rohtak, Haryana, India

ABSTRACT

Growth and digestive enzymes activity were studied in *Oreochromis mossambicus* (Tilapia) in response to 0.1mg/l thiourea. This treatment suppressed the growth and digestive enzymes activity of *O. mossambicus* significantly. 0.1mg/l thiourea decreased the glycogen levels of the liver. Experiment showed that thiourea treatment was very effective in depleting the protein content of muscle. Thiourea significantly showed their effect on Hepatosomatic index (HSI) and Viscerosomatic index (VSI) as both biometric indexes decreased in fish faced this organic compound.

KEYWORDS: Growth, Digestive Enzymes Activity, Thiourea

INTRODUCTION

Living in an environment that has been altered considerably by anthropogenic activities, fish are often exposed to a multitude of stressors including heavy metals. Environmental pollutants such as metals, pesticides and other organics pose serious risks to many aquatic organisms including fish. Water pollution with heavy metals, affects various physiological processes in fish, including growth and metabolism.

Thiourea is an organic compounds consisting of carbon, nitrogen, sulphur and hydrogen with the formula that is CSN_2H_4. Thiourea is a white and sparkling crystal in structure. Thiourea derivatives and polyazomethines constitute important classes of chelating agents. Thiourea has been seen to have varied effects in fish. Data analysis revealed that thiourea exerts inhibitory (Chambers 1951, 1953) as well as stimulatory (Hopper 1965) effects on liver lipid stores in Fundulus. Thiourea has already been demonstrated to depress both the synthesis and the release of thyroid hormone in different species of fish (Singh 1970; Singh et al. 1977; Milne and Leatherland 1978). In animals, thiourea is rapidly absorbed from the gastrointestinal tract and hence alters the physiological processes. The acute toxicity of thiourea varies with the species, strain, and age of the animals exposed to the chemical

The aim of the present study was to study the effect of thiourea on growth and digestive enzymes activity in *Oreochromis mossambicus* (Tilapia) fish.

MATERIALS AND METHODS

Fingerlings of *O. mossambicus* having a mean weight of 4.30 g (4.21 to 4.39 g) were collected from the Lahli-Baniyani Fish Farm, Rohtak and were maintained at the laboratory in glass aquaria under 12L: 12D photoperiod and 25 ± 2°C for 2 weeks.

The fish were fed 5% of their body weight with a formulated feed (having 40% protein) throughout the experimental period (30 days).

Experimental procedure: Prior to the start for the experiment, the fish were divided into 2 groups. First group fish act a control and second group was subjected to thiourea. The experiment was carried out with ten Tilapia individuals which were subjected to thiourea 0.1g/l water. The immersion of fish in these solutions has been made after they have been well stirred and aired for five minutes and the immersion solution has been changed every 24 hours.

Sampling Procedure: At the end of the experiment (after 30 days) weight and length of the fishes were recorded. After weighed Fish were killed and samples of liver, muscles intestines were carefully dissected and weighed. All samples were stored frozen at −80°C until analysis.

For digestive enzyme activity, Kunitz 1947, Bernified 1955, Colowick and Kaplan 1955, Sadasivam and Manickam 1996 methods were followed. Parameters like Muscles glycogen, muscle protein and liver glycogen were recorded by AOAC 1995.

Biometric indexes were also calculated: hepatosomatic index (HSI) = liver weight × 100/body weight and Viscero-somatic index (VSI) visceral weight × 100/body weight.

ANOVA followed by Duncan's multiple range test and Student's t-test was applied to assess the significance of the differences among treatments.

RESULTS AND DISCUSSION

In studied concentration, the thiourea 0.1 g/l water effects the values of growth parameters as shown in Table 1. At the concentration of 0.1g thiourea /l water significantly reduced specific growth rate (SGR %) and percent gain in body weight in Tilapia fingerlings. Similar trend with growth was observed in juvenile guppy, Poecilia reticulate by Pandey and John (1970) where thiourea inhibits growth. The muscle protein and liver protein was found to be significantly influenced by the concentration of thiourea into the water Table 2. Unlike the findings in Fundulus (Chambers 1951; Hopper 1965), thiourea administration had no effect on the liver and muscle lipid content of *H. fossilis.* Thiourea was effective in changing

the glycogen content of the muscle. Opposite results were recorded by Singh and Singh (1979) where thiourea was ineffective in change of muscle glycogen. Dose-dependent response has been noted in the coho salmon, *Oncorhynchus kisutch* (Higgs et al. 1976)

HSI and VSI significantly decreased in present study Table 1. This is in agreement with the report of Hatey (1950) where thiourea treatment in carp decreased the liver size. Contrary to this, Chambers (1951, 1953) noted an increase in liver size after thiourea treatment. Experimental results on effects of thiourea on fish digestive enzymes are very scarce. Digestive enzymes activity (Protease, amylase, cellulase and lipase) significantly reduced in our study in thiourea subjected fish Table 2 which indicates that thiourea act as water pollutant and hence affect the metabolic activity of fish.

CONCLUSION

Thiourea act a water pollutant and significantly reduced growth and digestive enzyme activities in *Oreochromis mossambicus* fish.

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Table 1 Effect of thiourea on the growth of *Oreochromis mossambicus* fingerlings.

Parameters	Control	Thiourea 0.1mg/l
Initial weight (gm)	4.21	4.21
Final weight (gm)	5.33	4.11
Growth (% gain in body wt.)	26.60±0.09	-2.38±0.11
Specific growth rate (SGR%g/d))	0.53^{a} ± 0.03	0.08^{b}± 0.05
VSI (%)	11.24 ±0.06	10.77±0.09
HSI (%)	3.59^{a} ±0.02	2.60^{b}±0.07

All the vales are mean ±S.E of mean. Mean with the same letter/s in the same row are significantly (P>0.05) different

Table 2 Effect of thiourea on digestive enzyme activity of *Oreochromis mossambicus* fingerlings

Parameters	Control	Thiourea 0.1mg/l
Specific protease activity[A]	1.95^{a} ±0.04	0.57^{b} ±0.07
Specific amylase activity[B]	2.53^{a} ±0.04	1.43^{b}±0.03
Specific cellulase activity[C]	1.30^{b}±0.11	1.18^{a} ±0.09
Specific lipase activity[D]	0.0062 ±0.01	0.0059 ±0.04
Muscle protein (mg/g)	23.78^{a}±0.48	12.09^{b}±0.37
Muscle glycogen (mg/g)	0.28 ±0.04	0.24 ±0.08
Liver glycogen (mg/g)	3.41^{a}±0.02	2.47^{b}±0.11

All the vales are mean ±S.E of mean. Mean with the same letter/s in the same row are not significantly (P>0.05) different

[A]=mg of tyrosine mg^{-1} of protein h^{-1}
[B]=mg of maltose mg^{-1} of protein h^{-1}
[C]=mg of glucose mg^{-1} of protein h^{-1}
[D]=mg/mg of protein/h