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EFFECT OF CONTRA/INSECT 500/50 E.C. PESTICIDE ON THE BIOENERGETIC COMPONENTS OF THE OREOCHROMIS SPILURUS FISH

BY

FATMA A. ELNEMAKI
King Abdullaziz University, Faculty of Science, Biology Department, Jeddah, Saudi Arabia.

ABSTRACT

Oreochromis spilurus fish was exposed to the three concentrations 0.015(1), 0.035(2), 0.070(3) mg/l of the compound contra/insect 500/50 E.C.pesticide for 24,72,120, and 168 hours. This pesticide contains 50% of its weight Chloropyrifos and 5% cypermethrin. While the Chloropyrifos is from the organophosphorus chemical group, the cypermethrin is from the pyrethroid group. Results showed general elevations in the serum glucose levels of the exposed fish as we compared it with the control, except some cases. The glucose significantly increased as the exposure time of the pesticide concentration 0.07 mg/l (3) increased. With the concentrations 0.015 mg/l (1) and 0 ^35 mg/l (2) the glucose increased at the 72 hours exposure time then declined at the 120 & 168 hours. The increase of the serum glucose levels contrasts the decline of the muscle and liver glycogen contents of the exposed fish in most cases. However, the depletion of both contents in the other cases indicated that fish tissues processed both glycogenolysis and glycol sis to overcome the loss of energy due to the pesticide induced-hypoxia.

INTRODUCTION

Pesticides coming directly throw the water resources or throw food chain can affect different species of fish such as Tilapia species. The effect of pesticides on fish bioenergetics have been investigated by different researchers. Al-Akel *et al*, 1995 & 2000) tested the effect of permethrin, and carbaryl insecticides on the blood glucose and liver, muscle, and brain glycogen of *Oreachromis niloticus* in two different experiments. Difficulty in fish respiration in addition to the increase of the fish glucose level, and depletion of the glycogen were observed. Same findings were observed in another study by (Al Kahem, 1996), when *Oreachromis niloticus* was exposed to different concentrations of the insecticide lindan. The glycogen contents of the liver and muscles depleted significantly

($P<0.001$) and the fish showed signs of serious stress that involved changes in the metabolic rate. In another study by (Carr, et al., 1997) it was found that the Chloropyrifos, which is organophosphorus pesticide, had a different effect on the biochemical mechanisms of the fish. Physiological alternations of the brain, gills, liver, muscles and blood plasma of the fish was also observed by various researchers such as (Oruc and Uner, 1998&1999, and Gill et al., 1990).

The aim of the present study was to investigate the effect of the compound pesticide contra /insect 500/50 E.C. on the bioenergetics components of the Oreochromis spilurus fish. Contra/Insect 500/50 E.C. It is a broad-spectrum insecticide that controls a wide range of, sucking and chewing insect, and pests in vegetables, fruit trees, field crops and ornamental plants. Contra/ Insect contains 50% of its weight Chloropyrifos and 5% cypermethrin. While the Chloropyrifos is from the organophosphorus chemical group, the cypermethrin is from the pyrethroid group.

MATERIALS AND METHODS

Healthy specimen of the *Oreochromis spilurus* fish of average length ranged from 12.1 to 14.2 cm, and average weight ranged from 28.3 to 47.9 g., were collected from the fish farm of the oceanography faculty in Abhor, Jeddah. Fish were kept in a concrete tank of about 6000 liters of water capacity, under the shaded farm. The holding tank received a continuous supply of, the Red sea water. Mechanical air pumps were used to aerate the fish tank. Fish were held six weeks in the tank under experimental conditions for acclimation. During the period of acclimation the fish were fed a commercial fish food ad libitum twice daily. After the acclimation period ended, which was judged by normal activity of the fish; feeding was stopped 24 hrs before and during the experiments.

Glass aquaria of 60 liters capacity were prepared for the study. The aquaria were supplied with 50 liters of filtered seawater, air pipes, and air stones connected to an aeration pump.

The sub lethal concentrations were estimated based on results obtained for the LC50 and LC90 of the exposed fish (Elnemaki, 2001) and (Murty, 1986), in the first stage of the present work. The fish were exposed to three pesticide sub lethal concentrations, 0.015(1), 0.035(2), and 0.070(3) mg/l. for 7 days. The experiment was run in triplicate, and for each insecticide concentration one aquarium was used as a control where the fish were exposed to water free of insecticides.

Two fish were taken from each of sub lethal concentrations replicate at 24,72,120,and 168 hours post exposure time. Blood samples and tissues were taken from two fishes in each of the three triplicate of each pesticide concentration. The blood and tissue samples were taken after 24, 72, 120 and 168 hours post- exposure time. Blood samples were drawn from the caudal vessels of each fish by heparinated capillaries to measure the blood glucose using Accutrend Gct.device. Fish were dissected and muscle, liver, tissues were washed in 0.9 percent saline solution, labeled and put in icebox, then immediately transferred to –30c freezer for the bioenergetics analysis. The bioenergetics determinations were based on photometric colorimetric procedures using UV. spectrophotometer. The glycogen contents in the muscle and liver tissues were determined after KOH hydrolysis by anthron reagent (Van Lee, 1965). Before each analysis, samples from each tissue were weighted and Homogenized for 5 minutes (using High –Speed Homogenizer System) in ice. The homogenates were centrifuged for 15 minutes at 3500 rpms. Supernatant was used to estimate the muscle and liver glycogen.

Tests of betwcen-subjects effects and multiple comparisons of the blood glucose, and liver and muscle glycogen variables were carried out using SPSS. (Version 11.5) statistical programs.

RESULTS AND DISCUSSIONS

The results of the present study have demonstrated the effects of the three sub lethal concentrations of the contra/insect pesticide on the bioenergetic metabolism in *Oreochromis spilurus* fish. The estimated sub lethal concentrations of the pesticide were 0.015(1), 0.035(2), and 0.070(3) mg/l. All results are the averages of six individuals per each pesticide concentration, two from each of the three replicates.

The serum glucose significantly ($p<0.05$) increased as the exposure time of the pesticide concentration (3) increased Fig (1). With the concentrations 1&2 the glucose increased at the 72 hours exposure time then non- significantly declined at the 120&168 hours. As we compare the control with the exposed fish we generally found that as the concentration of the pesticide increased the level of glucose increased at the all time spans except at the 24hours. After 24 hours of exposure the glucose level remained without significant change.

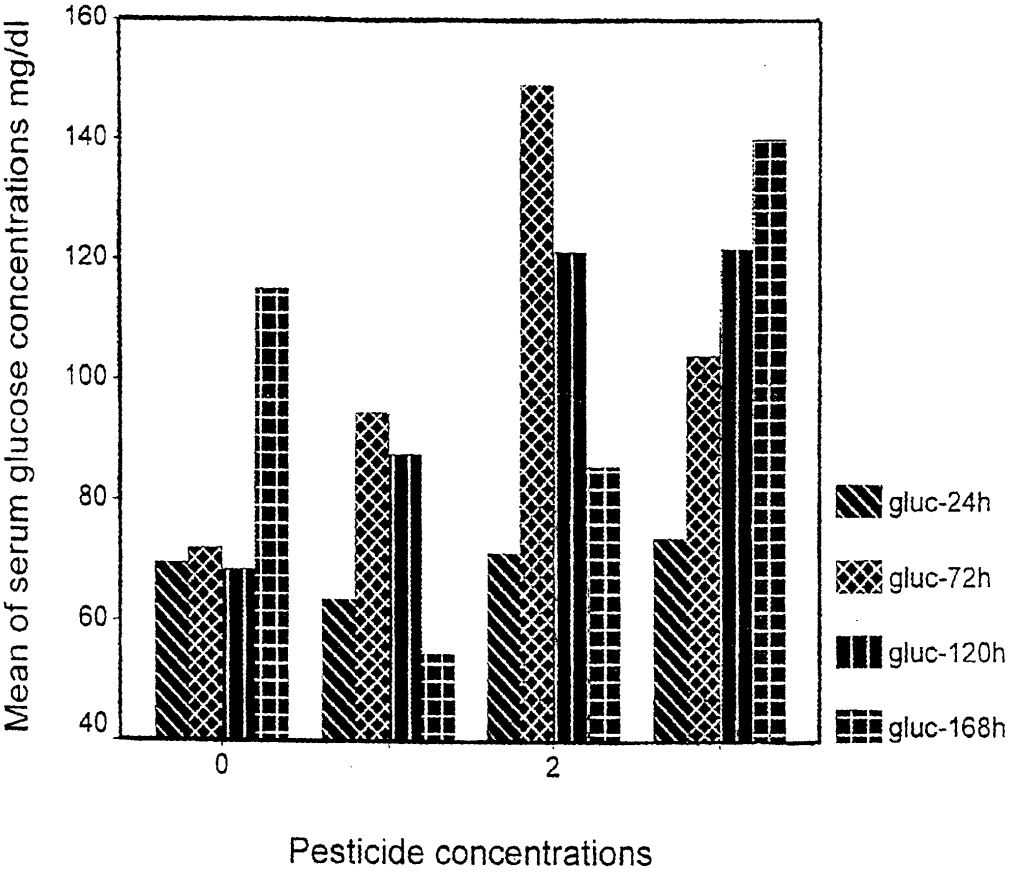

Fig. 1 : Alternations in the Serum glucose concentrations of *O. spilurus* exposed to 0.015(1), 0.035(2), 0.070 (3) mg/l concentrations of contra/insect pesticide. All Values are averages of 6 individuals that obtained at the end of 24, 72, 120and 168 hours of treatment.

Present results showed in most cases depletion of the glycogen of the fish muscles and liver after 168 hours of exposure to the three concentrations of the pesticide Fig (2&3). The muscle glycogen increased non-significantly after 168 hours of exposure to the concentration (1). There were no significant differences between the glycogen levels at most of other time spans. The decrease of the glucose and the glycogen levels after 144 hours of exposure in most cases, suggests that the fish became more stressed as the time of exposure increased and they needed more energy. Therefore, carbohydrates were utilized for energy production as a result of pesticide –induced hypoxia, and this caused both glycogenolysis and glycolysis in the tissues. This finding agreed with (Oruce and Uner,1999) who recorded a depletion of blood glucose and muscle and liver glycogen of the *Cyprinus carpio* after their exposure to 2,4 Diamin. The increase of the glucose at the highest concentration (3), which accompanied by the depletion of the glycogen agreed with the findings of the several studies. Dange(1986) found that short term exposure to DDT and endosulfan caused a depletion of liver and muscle glycogen and a rise in the plasma glucose level in *Oreochromis (Sarotherodon) mossambicus.* Al-Akel and Shamsi (2000) reported that after 96 hours of *Oreochromis niloticus* exposure to sub-lethal of the carbaryl insecticide, significant depletion of muscle, liver , and brain tissue glycogen ($p<0.001$) was recorded.

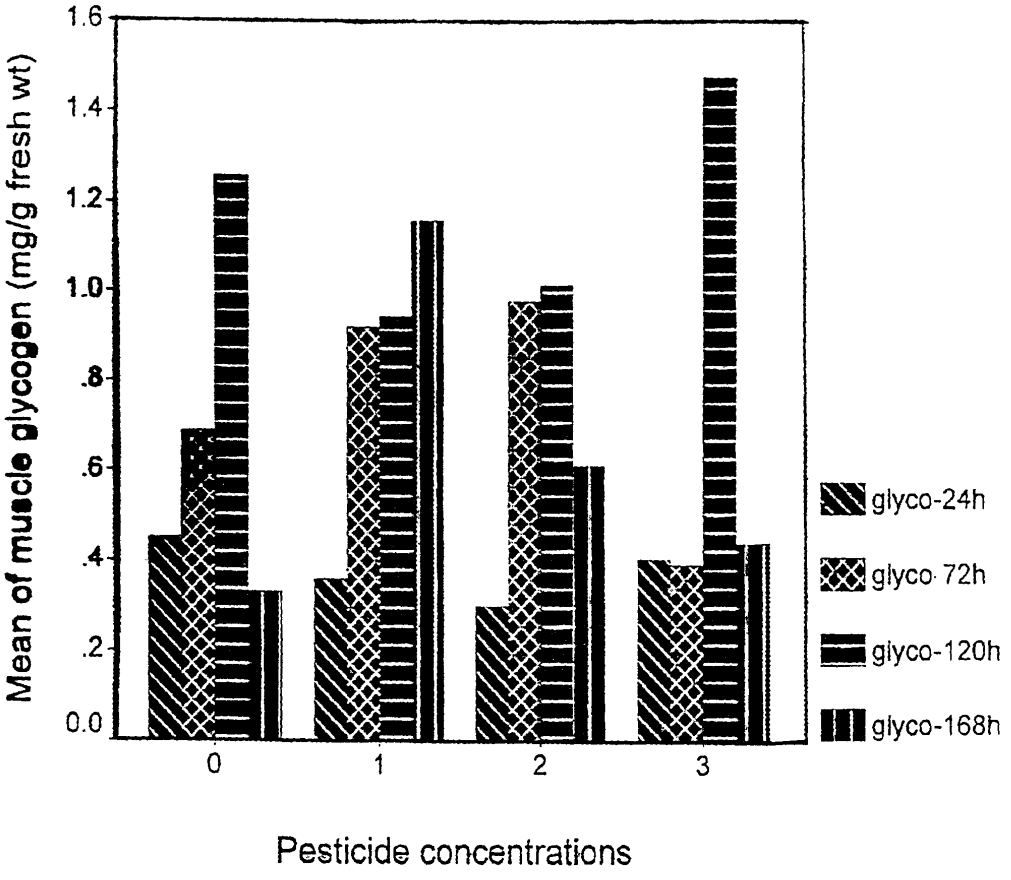

Fig. 2 : Alternations in the Muscle glycogen concentrations of *O. spilurus* exposed to 0.015(1), 0.035(2), 0.070 (3) mg/l concentrations of contra/insect pesticide.All Values are averages of 6 individuals that obtained at the end of 24, 72, 120and 168 hours of treatment.

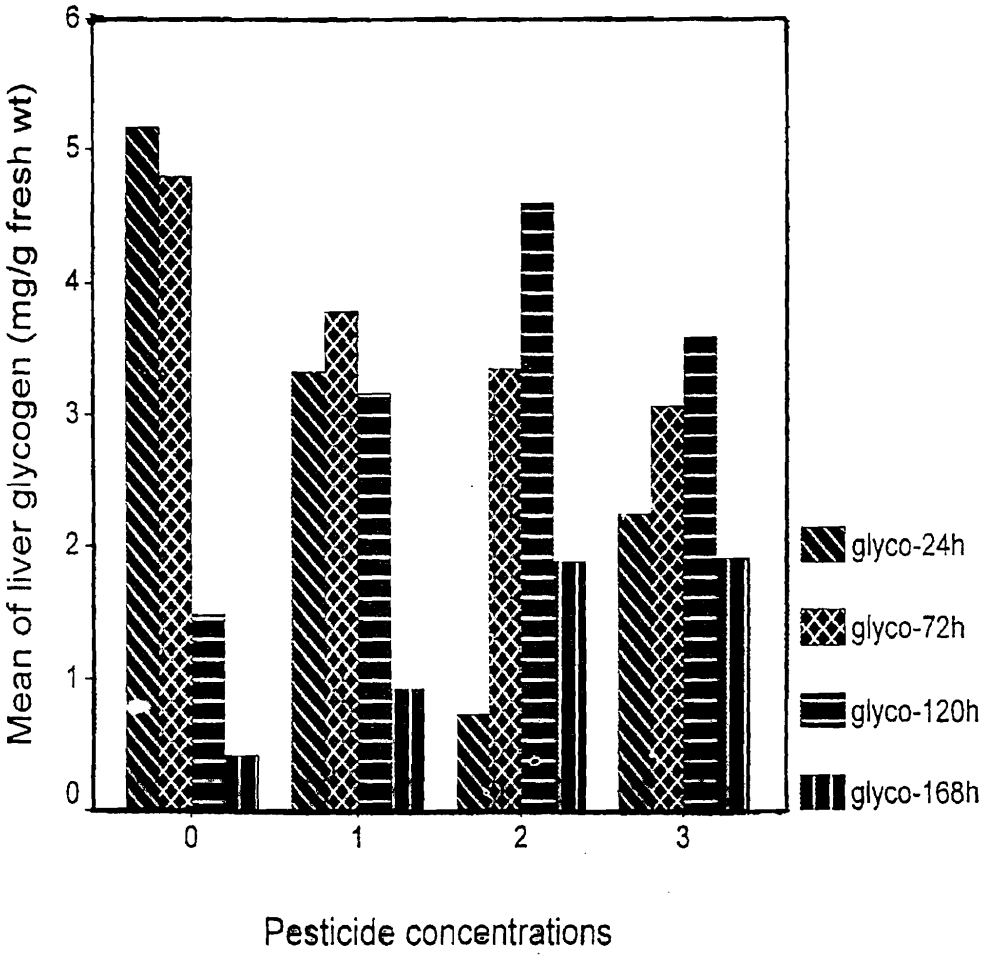

Fig. 3 : Alternations in the Liver glycogen concentrations of *O. spilurus* exposed to 0.015(1), 0.035(2), 0.070 (3) mg/l concentrations of contra/insect pesticide. All Values are averages of 6 individuals that obtained at the end of 24, 72, 120and 168 hours of treatment.

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