Behavioral Change and Histological Effects of Xenobiotics Exposure in Aquatic Organism

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Abstract. The present study investigates the adverse effects of exposure to the organic toxicant diazinon pesticide on aquatic organisms, and its potential effects on some behavioral and histological parameters organism tissue. One aquatic organism was selected to estimate diazinon toxicity in *Cyprinus carpio* fish. The LC50 96 - hours to diazinon was estimated for C. carpio (total n= 72) They were exposed to a range of different Concentrations related to diazinon (60% EC) (0, 6, 10, and 15 mg/L). The LC50 The period was 96 hours when she was found 9.5 mg /L. The fish are exposed to 25% of the LC50 (2.37 mg/L). behavioral effect estimated by monitoring experiment each test container was observed for (5-10) minutes, after ending 28 days, histopathology, effect was estimated. The behavioral results in this study were observed in fish (damage caudal fin, hyperactivity to hypoactive, change in skin pigmentation, sinking to the bottom, fish scales falling), when exposed to diazinon. while the histological changes of the fish, we notice a slight change in the tissues, necrosis in some areas, and damage to the intersections that preserve the general histological structure of the muscles as well as the submucosal layer of the largest size when compared to the control group.

1 Introduction

Chemicals organic compounds are necessary part of everyday life. They came in different shape of antibiotics, insecticide, fuels, plastic containers, fertilizer for agriculture, supplies for making copies, etc. Without them, society would not exist in its current shape. The amount of chemicals utilized has increased dramatically during the last few decades [1]. Bioaccumulation is the term used to describe how organisms take in, store, and accumulate organic and inorganic pollutants from their environment.

Environmental pollution that changes the behavior can have a significant effect on populations as well as community structures. The most typical signs of fish behavior disorders include paleness, neurological paralysis, imbalance, irregular swimming, and severe impatience. Immediately after exposure to poison fish were suffering from severe impatience and increasing toxicity concentrations with fish swimming in a half circle and the spine's curvature. Similar observations were also reported by [2, 3, 4].

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One important behavior is the ability to seize prey [5]. By inhibiting brain acetylcholinesterase (AChE) action, the organophosphate insecticide diazinon may cause aberrant nutrition behavior of cross bred barred bass (Morone saxatilis x M. chrysops). This may make it more difficult for the creature to identify and capture food, which could diminish its chances of surviving [6].

Following exposure to Diazinon, fish most frequently displayed neurological paralysis imbalance syndrome, abnormal swimming, sever impatience and paleness as their behavioral signs, were also reported by [7].

Histopathology assume the microscale check of cells and texture in an creature and the semi-quantitative identification of histological anomaly. Pesticides, like other toxic substances, stimulate the generation of free radicals that destroy the biomolecules that make up cells and cause changes in the tissues of living organisms.[8].

Damaging effects of diazinon, on bluegills fish (*Lepomis macrochirus*) was recorded after exposure to different concentration of diazinon the result show, Different types of changes were brought about by the diazinon concentrations, including lifting of the epithelial layer, necrosis, hyperplasia, lamellar fusion, severe hyperplasia, and mucous cell hypertrophy.

2 Material and Method

The *C. carpio* were obtained from a local fish farm, with a total weight 78.8g and length 13.3cm. leav for 14 days to adapt to the new environment. Continuous aeration to the containers was supplied with air bubble motors [9]. The water was replaced every 48 hours [10].

Following the completion of 14 days of acclimatization. Al-Fares Company supplied the 60% EC diazinon, for standard preparation. Diazinon was administered to fish at four different concentrations (0, 6, 10, and 15 mg/L) in order to calculate the fish's LC50 values, after 96 hours. For each concentration, three aquariums with six fish each in 70 L of dechlorinated tap water and control group. The water in the aquariums was also replaced every 48 hours.

The experiment used water with the following characteristics: pH 8.5 ± 0.3, Temperature 19 ± 2°C, and Oxygen that dissolves 6.4±0.45 mg/L [11].

The death rate was recorded; the Probit Analysis test was performed to determine the LC50 values [12]. The sub-lethal toxicity testing was performed handled. The fish were exposed, over a period of 28 days, to a single, almost lethal dose of diazinon, which was 2.37 mg/L (equivalent to 25% of the LC50).

Attitude and relating to the form or structure of things reaction response of C. carpio fish exposed to diazinon was observed during chronic toxicity tests. Methods were used in this study. Five indicators of these changes, namely loss of balance, general activity, startle response, bleeding, and deformity (including postural indicators), were observed with each test container observed for 5 to 10 minutes [13].

Histological examination in the fish in treated and control organisms after ending period of exposure of 28 days were killed, quickly dissected, and their flesh The specimen was removed, sliced, and then fixed in a 10% formalin solution. After 24 hours, the tissues underwent three rinses in 70% ethanol, followed by dehydration using a graded ethanol series, and subsequently embedding them in paraffin wax. The paraffin sections were then cut into 5-micrometer-thick slices using a microtome, it was dyed with hematoxylin and eosin, and tested under a illumination microscope [14].

3 Results and Discussion

The LC50 for 96 hour in the present study was found 9.5 mg/L for *C. carpio* exposed to diazinon. There is several studies dealing with the a change which is a result to diazinon on usual carp *C. carpio*, the effect of diazinon on hematological indices of common carp (*C. carpio*) and they found the LC50 was 26.7 mg/L [3]. Another study found the LC50 of diazinon on *C. carpio* was 9.76 mg/L [15]. Also previous study on other species of carp that carry out about "sub-lethal result of diazinon on hematological indexs and blood biochemical parameters in the indian carp, cirrhinus mrigala" they found the lC50 for diazinon on *c. mrigala* was 8.15 mg/L [10].

The LC50 values in this and other studies vary due to known environmental differences, such as the physical and chemical properties of environment, and the type of water used in the experiments that affect the toxicity of the pesticide to fish. In addition, other factors such as the duration of exposure, fish size, age, weight, length, and genetic content [16]. can play a role in changing the fish's metabolism, the persistence of the pesticide in the water, and its presence in the environment. In addition, substances dissolved in water can reduce the concentration of the pesticide through the adsorption process, resulting in a change in the uptake of the pesticide by fish. [17].

3.1 Behaviorally effect in fish

A set of observations have been made on the behavioral and morphological effects of C. carpio fish exposed to diazonone through a set of chronic toxicity tests [13]. Five behavioral and morphological indicators were observed in this study: loss of equilibrium, general activity, startle response, hemorrhage, and deformity (including postural indicators). Each test container was observed for (5-10) minutes.

Table 1. Behavioral effect performance of diazinon on *C. carpio*

Behavioural and the shape Symptoms	**Diagnosis**
Deformities	damage caudal fin
General activity	- hyperactive to hypoactive - Change in skin pigmentation - sinking to the bottom - fish scales falling
Hemorrhage	None
Loss of equilibrium	Yes
Startle response	underreactive

Fig. 1. Deformities (damage caudal fin) in *C. carpio* is exposed to diazinon

Fig. 2. Change in skin pigmentation in *C. carpio* is exposed to diazinon

This damaged caudal fin was recorded study effect of diazinon toxicity on embryonic and larval development stages in catfish [18]. There are many studies that note the deformed, caudal fin damage in early stages development in *C. carpio* with imidacloprid insecticide and other insecticides [19]. The other behavioral effects such as (less general activity, change in skin pigmentation and loss of equilibrium) it was observed that in fingerling European catfish that exposure to diazinon [20].

At the top symptoms may be as a result of inhibition of acetylcholinesterase (AChE) efficiency This means cumulation of acetylcholine (ACh) in cholinergic synapses ensuing more stimulation [21]. Since, inhibition of AChE activity is a PerfectTrait of organophosphate compounds [22].

3.2 Histopathological Effect

Following exposure to 2.37 mg/L of diazinon for 28 days in *C. carpio* fish. The muscle tissues exhibited typical histological structure in control groups, (Figs.3 A1 and A2). A perfect skeletal muscle, Appear Differ from muscle features such as the muscle Perimysium and Fascicle. Also show a typical striated muscle, showing are orderly in little bunch and little bunch are covered as big bunch. The biggest bunch with definite covering and specific shape is called a piece of streaked muscle. Whereas, in treatment group extensive damages in the muscle tissues of *C. carpio* fish were noticed. showing degenerative and loss the histological regulation with many necrosis zones as well as disappear the muscle characteristics like the muscle surrounding and also fascicle fig. (4).

Several authors have described changes in pathogenic tissue following exposure to diazinon in a variety of fish. an increase in retinal cell necrosis in medaka [23]. Changes occurring in the gill of the blue-gill sunfish [24], Lepomis Macrochirus (epithelial lifting, significant hyperplasia and necrosis, shortening of the lamellae and frequent epithelial rupture, fusion of lamellae and hyperplasia of mucus-forming cells) causing Sub-lethal concentrations of diazinon significantly damaged the intestinal wall of the freshwater teleost Channa punctatus [25].

The histopathological deformities in the muscle tissues of fish could act as a sensitive indicator for deciding signs of pollutants stress [26]. Pesticides, like many toxins, stimulate and generate free radicals that destroy the biomolecules that make up cells, so these changes in fish muscles are a unique reflection of the toxic effect of pollutants [8]. A range of programs have been used to bio-monitor the tissue changes seen in many different fish organs, which are considered vital indicators of the environmental quality of aquatic ecosystems [27].

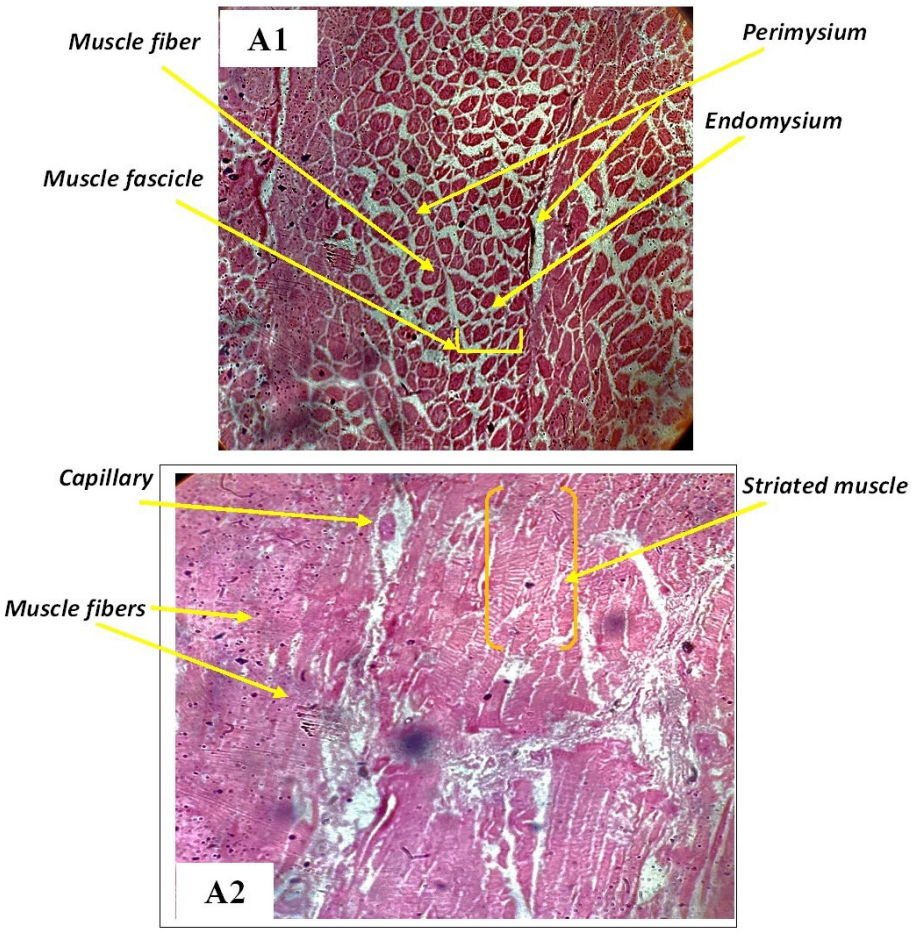

Fig. 3. Cross Section in Muscle Tissue in Control Group of C. carpio Fish
Fig. 3A1. A Micrograph of a cross section of a perfect skeletal muscle of a *C. carpio* Different muscle features such as Perimysium and Fascicle appear as analyzed in the study (H&E)
Fig. 3A2. A Micrograph of a typical cross section striated muscle in *C. carpio* The supply is organized into small packages and the small packages are packaged as large packages. The largest bundle with a specific covering and specific shape is called a piece of striated muscle (H&E)

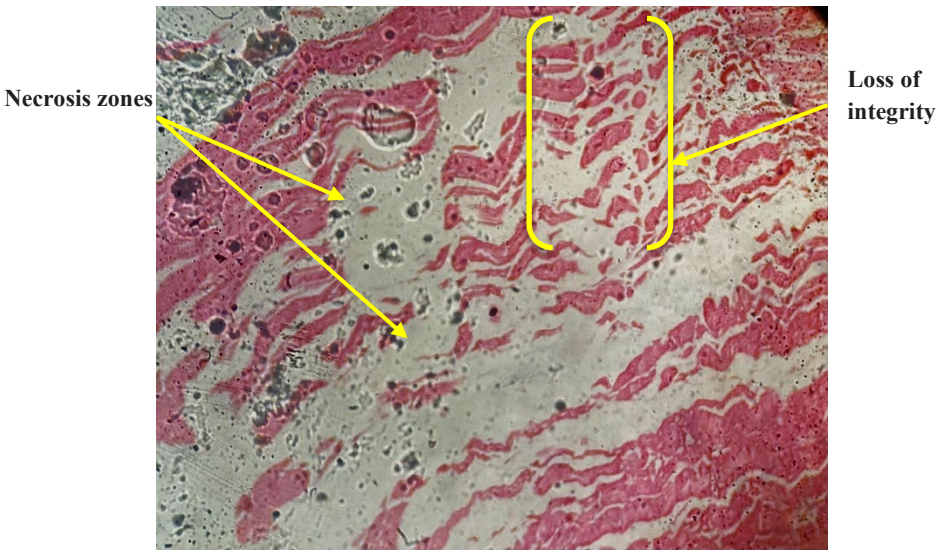

Fig. 4. Histological alteration in muscle tissue of a treated group of *C. carpio* fish after exposure to sub-lethal concentration of diazinon. Showing degenerative and loss the histological regulation with many necrosis zones as well as disappear the muscle characteristics like the muscle it perimysium and the fascicle as analyzed at the study (H&E)

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