G- Journal of Environmental Science and Technology

(An International Peer Reviewed Research Journal)

Available online at http://www.gjestenv.com

Impact of mercury on morphology of *Channa punctatus*

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ARTICLE INFO

Received: **09 May 2015**
Revised : **25 May 2015**
Accepted: **17 Jun 2015**

***Key words*:**
Mercury, LC_{50}, *Channa Punctatus*, morphology

ABSTRACT

Mercury is among the most toxic of the heavy metals. Once released it persist in the environment and cause great damage to the aquatic fauna. LC_{50} value for present study was calculated by probit analysis. Different concentrations of mercuric chloride salt were used to see the impact on *Channa punctatus* for morphological alterations. Inhibitory decrease in coloration of body along with exophathalmic condition of eyes were noted.

1) INTRODUCTION

The toxic contaminants may be of two fundamental types. The first type is natural that occurs commonly in nature, at relatively low concentrations. These materials, though toxic at high concentrations, may be metabolic necessity at trace levels. Many heavy metals fall into this category [1]. Since fishes have evolved in the presence of heavy metals, they have developed certain inherent adaptations to them at normal, ambient concentrations. The second category of contaminants consists of "aberrant" substances which are created by man. Fishes have no evolutionary adaptation to these synthesized, xenobiotic materials and toxic effect of these aberrant materials may be disproportionately great even at low concentration levels [2].

Among such substances are the heavy metals and with the rapid industrialization their use also increased manifolds. This has drastically changed their biogeochemical cycles. These are stable and persistent environmental contaminants and cannot be degraded or destroyed and have adverse effect in human beings also [3, 4].

Much of these pollutants ultimately reach water. Water forms one of the basic component of the environment and indiscriminate use of technological advancement s have threatened the carrying capacity of our aquatic ecosystems. In the present study mercury one of the heavy metal is used to investigate its toxicity on morphology of *Channa punctatus*.

2) MATERIALS AND METHODS

For the present studies live specimens of Channa Punctatus were collected. They were given bath in 0.1% $KMnO_4$ for 2-3 minutes. The fishes were acclimatized for 7 days under laboratory conditions. Mercury in the form of mercuric chloride was used for present investigations. The salt is selected because of its uses in industries reported toxicity and water solubility.

LC50 value for present study was calculated by Probit analysis as suggested by Finney [5]. Based on the probit analysis technique, 96h LC50 value was found to be 1.21 mg/L by graphical interpolation and arithmetic methods. A stock solution of 1 g/L was prepared in normal tap water. From the stock solution measured aliquots of this was added to each experimental tanks so as to bring the mercuric chloride concentrations to required levels i.e. 0.08 mg/L, 0.10 mg/L, 0.25 mg/L, 0.40 mg/L and 0.55 mg/L. The fishes were exposed to these concentrations for 15 days.

3) RESULTS AND DISCUSSION

Apparent changes in the external morphology of the Channa punctatus were recorded when exposed to different sublethal concentrations of mercury (0.80-0.55 mg/L). The inhibitory decrease in coloration **(Fig.1)** and excessive mucous secretion were directly related to mercury concentrations and exposure period [6]. In addition to these changes, loosening of scales and bulging of eye balls (exophthalmaia) were also observed **(Fig.2)**.

Along with the above said changes there were few other alterations in the body proportions in the head region that were recorded during the present course of study. These alterations are in proportion to the head length. These alternations are given in **Table 1**. Choudhary et al. [7] reported that Labeo rohita scales showed increased depigmentation when treated with water extract of heavy exudation of mucous over the body and depigmentation of body under the toxic stress of Mercury that is attributed to the dysfunctioing of endocrine/pituitary gland. He also reported change in number and body and depigmentation of body under the toxic stress of Mercury that is attributed to the dysfunctioing of

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endocrine/pituitary gland. He also reported change in number and areas of mucous gland and chromatophores.

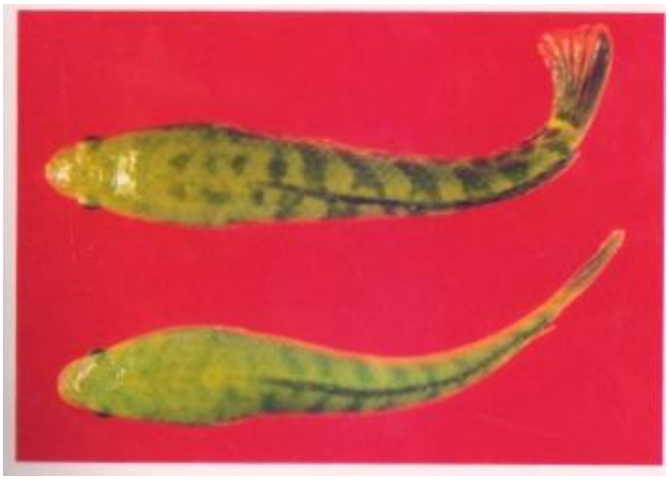


Fig.1: Loss of pigmentation in Channa punctatus due to mercury exposure.



Fig.2: Head region of Channa punctatus showing normal (left) and exophathalmic (right) eyes.

Table 1. Control and altered morphological parameters of the Channa punctatus

Sr. No.	Morphological Characters	Control (mm)	Treated Group (mm)
1	Head depth	43.61 (43.63-48.64)	46.05 (43.66-52.00)
2	Preorbital distance	18.4 (15.97-21.33)	16.4 (10.53-21.02)
3	Postorbital distance	71.54 (65.49-79.18)	75.06 (65.11-82.60)
4	Interorbital distance	27.93 (31.8-25.13)	25.95 (14.05-34.57)
5	Eye diameter	12.87 (11.03-14.74)	14.25 (11.08-16.21)

Similar observations have also been reported by Pandey et al. [8] in Channa punctatus under the toxicological stress of Malathion. Gopal et al. [9] demonstrated similar effects of Lindane on Claries batrachus. This marked loss of pigmentation could be because of reduction in release of melanophore stimulating hormone as was reported by Ball and Baker [10] when working with Endosulfan.

Van Duijin [11] concluded that in some fishes, exophthalmia condition is due to the disturbances in hormonal equilibrium of hypophysis. Similar results were reported by Malhotra et al. [12] in Channa punctatus when induced by the Chelonian corpus luteum. The exact reason needs to be worked out. However, it may be concluded that Mercury disturbs the hypophysial target organ axis, thereby resulting in hormonal imbalance that brings about alterations in the morphology as well as the physiology of the fish.

The loosening of scales is because of the damage imparted to the lepidonts, which otherwise act as minute hooks thus helping in the strengthening of the scales held on the body.

The clinical and hematological findings suggest that the harmful effect linked with rice husk dust. There is significant greator proportion of anemia and leukocytosis were observed.Rice husk dust could cause keratoconjunctival irritation , corneal scars, chronic conjuctival inflammation , pterygium formation and pruritus[8] . In addition, allergic inflammatory reactions of pulmonary tissues were suggested to be related with rice husk exposures. According to this study, it seems that there is a impairment of the hematological parameters for the rice mill workers and it indicates further extensive epidemiological and pathological studies health and safety of the rice mill workers. This study would be helpful in preventing longstanding harmful effects of such exposures of rice husk.

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