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INFLUENCE OF LEAF EXTRACT OF CARICA PAPAYA LEAF AGAINST MERCURIC CHLORIDE INDUCED HEPATIC ENZYMOLOGICAL CHANGES IN LABEO ROHITA (HAM.)

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ABSTRACT

In the fish *Labeo rohita*, the effect of a sub-lethal concentration of mercuric chloride (0.005 ppm) for 7 days on the activities of ACP, ALP, GOT and GPT, as well as their recovery (Ham.). When liver tissue is exposed to mercuric chloride, it shows a considerable decrease in ACP, ALP as well as an increase in GOT and GPT activities. During the recovery, all of the above metrics returned to near-normal levels thanks to *Carica papaya* treatment of mercury-treated fish. The findings suggested that exposing the fish *Labeo rohita* to *Carica papaya* competitively lowered mercuric chloride toxicity (Ham).

Key words: *Labeo rohita*, *Carica papaya*, ACP, ALP, GOT and GPT

INTRODUCTION

Many freshwater environments are threatened by pollution produced by the rise of industries, technology, and informal settlements. Pollution not only reduces the quality of water, but it also has an impact on all living species in the system. As a result, it's critical to not only identify and manage these pollution sources, but also to keep an eye on their consequences on the aquatic environment's health. Human activities are mostly responsible for increasing environmental pollution by introducing undesirable harmful substances (Bryan,1976).

Heavy metals are abundant in the natural environment, with the majority of them posing serious health risks to organisms (Bamennan and Schiesty, 1996). Pollution has toxicological effects due to its long-term persistence and build up in organisms (Goyer, 1996). Heavy metals play an important part in metabolic pathways, but when their concentrations above a certain threshold, they function as physiological, biochemical, and behavioural inhibitors in organisms. Metals are elements that naturally occur in aquatic habitats as a result of weathering and erosion (Viljoen, 1999). In trace levels, some of these elements are required by living organisms (for example copper and zinc). For growth and reproduction, essential trace elements have a narrow ideal concentration range, and both excess and shortfall can be harmful to organisms (Pelgromet al., 1994), with extremely high concentrations proving poisonous to aquatic organisms (Pelgromet al., 1994). (Wepeneret al., 2001). Other metals, such as cadmium and lead, are thought to have no biological purpose (Seymore, 1994). Cadmium is a prominent pollutant of aquatic habitats (Mungeret al., 1999) that is hazardous to aquatic animals (Witeskaet al., 1995) even at natural water concentrations (Pelgromet al., 1994). Metals are prevalent in natural aquatic habitats in very low concentrations (Nussey, 1998). Zinc, copper, lead, cadmium, mercury, nickel, and chromium are the most common heavy metals found in water contamination (Seymore, 1994; Viljoen, 1999). Metal uptake by aquatic organisms is a two-step process that begins with fast adsorption or surface binding and then moves slowly into the cell core. Diffusion of the metal ion through the cell membrane or active transport by a carrier protein can help metals get into the intracellular region (Brezoniket al., 1991; Wepeneret al., 2001).

Fish's health can be harmed either directly through water intake or indirectly through their diet of vegetation, invertebrates, and smaller fish. Several fish physiological anomalies are caused by metals injected into aquatic habitats (Sehgal and Saxena, 1986). They can also disrupt aquatic creatures' ion regulatory mechanisms (Hansen et al., 1996). All of these impacts of heavy metals usually have a negative impact on fish, causing stress and, in most cases, death.

Heavy metals are constantly poisoning natural waters, with several negative consequences for living organisms, including commercially significant fish. They are also to blame for a variety of changes in fish physiological and biochemical markers (Shaffi, 1979). Arsenic is found in soils, sediments, water, air, and living creatures in large quantities. Natural water arsenic concentrations range from less than 0.5 mg/l to more than 5000 mg/l. Extreme concentrations are uncommon, however they can be found in groundwater (Smedleyet al., 2002).

Fish are susceptible to toxins in the water, and when pollutants penetrate the fish's organs, they can harm various physiological and biochemical processes (Tulasiet al.,1992). Heavy metals in fish tissue may induce a variety of physiological problems as well as mortality (Torres et al.,1987). Fishes that are commonly used to assess the health of the aquatic environment and can be utilised as a bioindicator of environmental pollution (Dautrempuits etal.,2004).

In higher animals, the liver is one of the most complex and active organs. The liver is the most significant target organ in a vertebrate body since it is the primary metabolic and detoxifying centre (Abbasi, and Sujata Krishnan, 1993). It is involved in a wide range of metabolic processes, including the creation of bile, which comprises bile salts, bile pigments, cholesterol, and lecithin. The kidney is primarily responsible for the elimination of waste products. Several researchers have looked into the harmful consequences of heavy metals and pesticides on the kidneys of various animals (Rajamanickam 1992). The kidney in fish, as in higher vertebrates, plays a crucial role in electrolyte and water balance, as well as the preservation of a stable internal environment. Ammonia and urea, both nitrogen-containing waste products of metabolism, are excreted by the kidney.

MATERIALS AND METHODS

Labeo rohita was collected from the S.M. fish farm located in, Swamimalai and 8 km away from the Government College for Women (A), Kumbakonam. The collected fishes without least disturbance were transported in polythene bags filled half with water without any disturbances. About 100 fishes were put in each bag and water was well aerated, using pressurized air from a cylinder. These modes of transit have proved successful, since there was no mortality in all consignments throughout the course of this study. *L. rohita* fingerlings were divided into 3 groups of 10 each for bio enzymological studies. Fingerlings of Group I was reared in metal free water and maintained as control. Group II and III were exposed to sub lethal concentration of mercuric chloride (0.13 L. rohita fingerlings were divided into 3 groups of 10 each for bio enzymological studies. Fingerlings of Group I was reared in metal free water and maintained as control. Group II and III were exposed to sub lethal concentration of mercuric chloride (0.005 ppm) for 7 days. After 7 days, Group III was again treated with *Carica papaya* leaf at required concentration (5 ppm) (recovery period) for another 7 days.

ACP and ALP activities were estimated by the method of Tennis wood et al., (1976) and GOT and GPT activities by the method of King (1965).

RESULTS AND DISCUSSION

In the liver of *L. rohita* fingerlings with sub- lethal concentration of mercuric chloride the levels of ACP and ALP were lower when compared to control while the level of GOT, GPT and activities were higher (Table 1). ACP, ALP levels and reduction in the levels were increased and GOT, GPT and glycogen to near normal level. Treatment with *Carica papaya* leaf.

ACP is a lysosomal enzyme present in the endoplasmic reticulum, whereas ALP is a hepatocyte-specific membrane-bound enzyme (Shakoori et al., 1992). The loss of ACP and ALP activity in the liver tissue of mercuric chloride-intoxicated fish could be attributed to changes in plasma membrane permeability, as well as a shift in the balance between enzyme protein synthesis and breakdown (Jagadeesan and Kavitha 2006). HgCl2 intoxication dramatically reduced ACP and ALP activity in the freshwater teleost fish *Channa punctatus*, according to Sastry and Gupta (2005). According to Humtsoe et al. (2007), a drop in ACP and ALP levels indicated a disruption in the structure and integrity of cell organelles such as the endoplasmic reticulum and membrane transport system.

The level of GOT, GPT, and Glycogen activities in the liver tissue of fish treated with HgCl 2 for 4 days rose in the current study, indicating the influence of mercury toxicity. The rise in GOT and GPT could be related to hepatic necrosis, which increased cell membrane permeability, allowing transaminase activity to be released (Vandenberghe, 1995). Several researchers found a similar outcome in the liver tissue of Mus musculus mice treated with HgCl 2. (Jagadeesan and Kavitha, 2006; Sharma et al. 2002 and Margarat, 2001). During the recovery phase, mercuric chloride intoxicated fish showed a drop in ACP, ALP, as well as a rise in GOT, GOT, and glycogen levels to near normal levels, thanks to *Carica papaya leaf* treatment. Because *Carica papaya* leaf is a chelating agent that can remove heavy metal toxicity (Burrough and Kastner, 1993), it is thought that *Carica papaya* leaf could be employed as an antagonist against mercury poisoning.

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Fig – 1 The level of Acid phoshpatase (ACP) in the Liver tissue of fish *Labeo rohita exposed* with Sub- lethal concentration of $Hgcl_2$ followed by 7 days of *Carica papaya* leaf extract treatment.

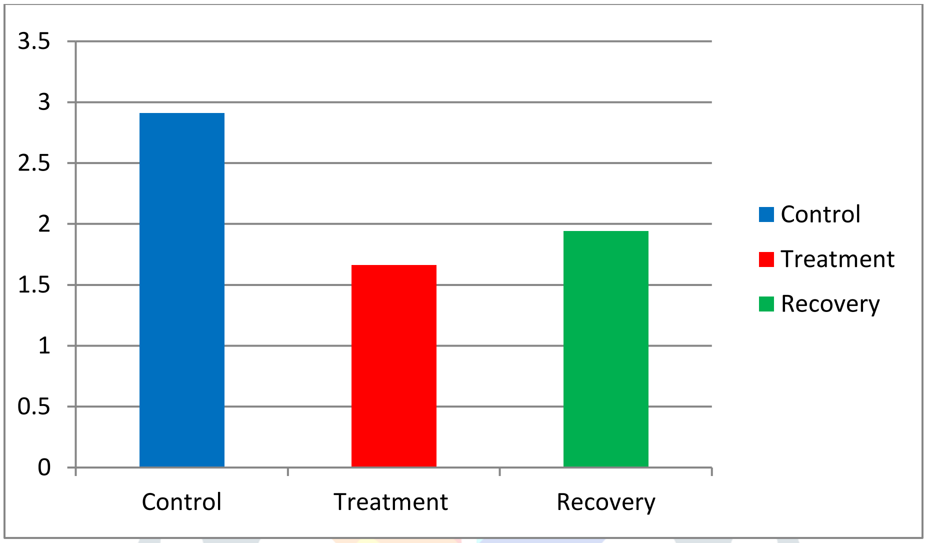

Fig – 2 The level of Alkalaine phoshpatase (ALP) in the Liver tissue of fresh water fish *Labeo rohita exposed* with Sub-lethal concentration of $Hgcl_2$ followed by 7 days of *Carica papaya* leaf extract treatment.

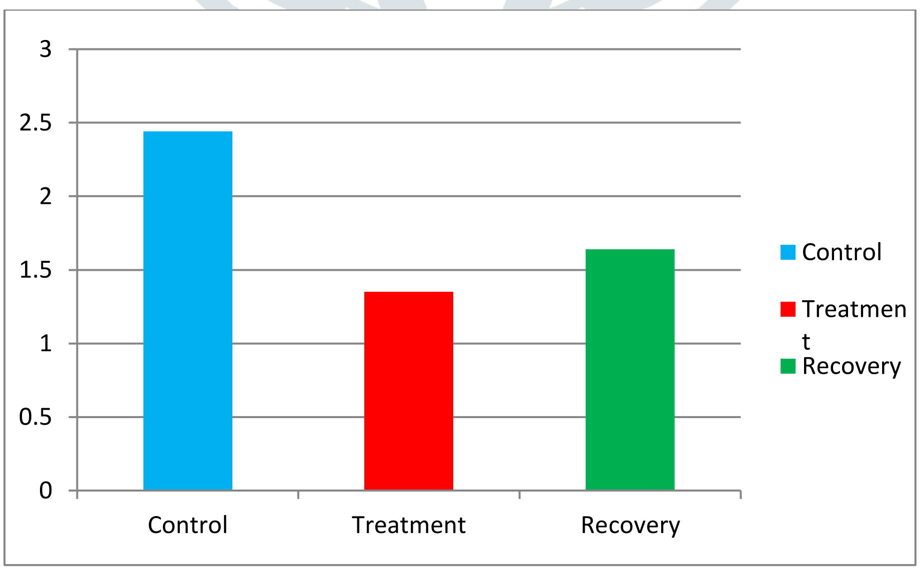

Fig – 3 The level of Glutamic Oxaloacetic Transaminase (GOT) in the selected Liver tissue of fresh water fish *Labeo rohita* with Sub- lethal concentration of $Hgcl_2$ followed by 7 days of *Carrica papaya* leaf extract treatment.

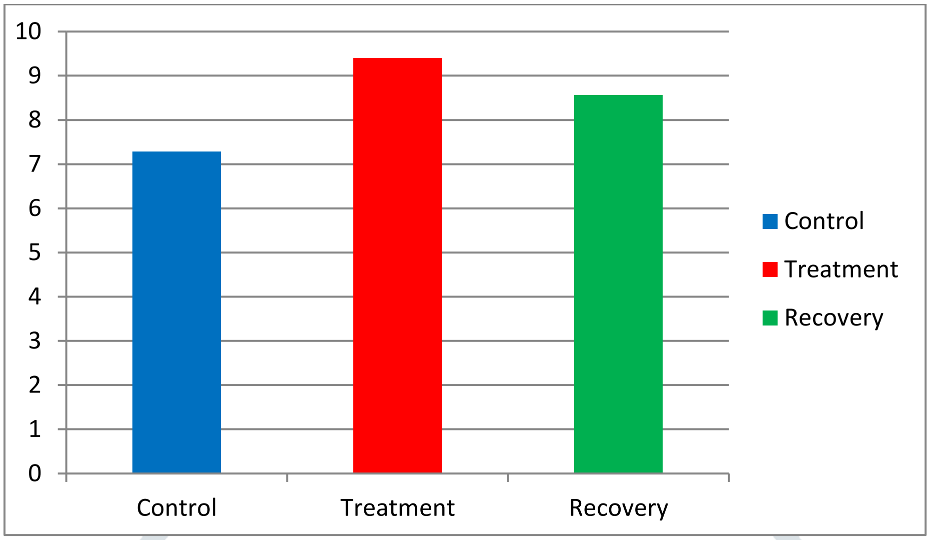

Fig – 4 The level of Glutamic Pyruvic Transaminase (GPT) in the Liver tissue of fresh water fish *Labeo rohita* exposed with Sub- lethal concentration of $Hgcl_2$ followed by 7 days of *Carica papaya* leaf extract treatment.