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Toxic effects of *Parthenium hysterophorus* on Histology of Kidney of freshwater fish *Labeo rohita*.

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Abstract

Toxicity study was conducted on freshwater fish *Labeo rohita* to evaluate the histological and haematological effects of *Parthenium hysterophorus* on kidney of *Labeo rohita* upto 96hrs. duration i.e. 24,48,72 and 96 hrs. which shown toxic effect on kidney.

Keywords: *Parthenium hysterophorus,* Kidney Histology, *Labeo rohita.*

Introduction

Water is a critical issue for the survival of all living organisms. Some can use salt water but many organisms including the great majority of higher plants and most mammals must have access to fresh water to live. Some terrestrial mammals, especially desert rodents appear to survive without drinking but they do generate water through the metabolism of cereal seeds and they also have mechanisms to conserve water to the maximum degree.

The use of water by humans for activities such as irrigation and industrial applications can have adverse impacts on down-stream ecosystems. Chemical contamination of fresh water can also seriously damage ecosystems. Out of all the water on Earth, salt water in oceans, seas and saline groundwater make up about 97% of it. Only 2.5–2.75% is fresh water, including 1.75–2% frozen in glaciers, ice and snow, 0.7–0.8% as fresh groundwater and soil moisture, and less than 0.01% of it as surface water in lakes, swamps and rivers [1].

Schwarzenbach *et al*., [2] reported that water pollution, has been increasing at an alarming rate due to rapid industrialization, civilization and green revolution. Urban, agricultural and industrial activities release xenobiotic compounds that may pollute the aquatic habitat. Industrialization and growth of human population have led to a progressive deterioration in the quality of the earth's environment.). . As the freshwater fishes in our country constitute an important part of animal protein in rural as well as in urban areas Water quality characteristics influence histopathological appearances of poisonous effects [3]. As the freshwater fishes in our country constitute an imban areas and also in the aquatic toxicology and the toxic pollutants significantly alter certain biochemical,histological and physiological procedures when they enter into the body. Pollution of the aquatic environment usually causes changes in the structural and physiological aspects of the inhabitant organisms. Histopathological disturbs by pollutants vary with the body parts, medium, nature of the pollutant and period of exposure [4].

Rohu is the natural inhabitant of freshwater sections of the rivers. Rohu is a bottom feeder and prefers to feed on plant matter including decaying vegetation. It is diurnal and generally solitary. The spawning season of rohu generally coincides with the southwest monsoon. Spawning takes place in flooded rivers.

During the early stages of its lifecycle, it eats mainly zooplankton, but as it grows, it eats more and more phytoplankton, and as a juvenile or adult is a herbivorous column feeder, eating mainly phytoplankton and submerged vegetation. It has modified, thin hair-like gill rakers, suggesting that it feeds by sieving the water. Rohu is the most commonly used fish in Pakistan and is usually eaten fried, or in a sauce with spices.

(*Parthenium hysterophorus* L.) Congress grass is an exotic weed comes under Asteraceae family, accidently introduced in India, 1955 in Pune through the imported food grains [5]. It has become naturalized and is spreading at an alarming rate all over India[6] and can adopt any climate very easily. Used as slurry in biogas. Traditional medicinal use: Root extracts are useful in dysentery [7]. It is used as folk remedies in West Indies and Central America [8]. American Indian uses a decoction of roots to cure amoebic dysentery. Sharma and Bhutani, [9] also reported as parthenium is promising remedy against hepatic amoebiasis. The *Parthenium hysterophorus* compost contains two times more nitrogen, phosphorus and potassium than Farm Yard Manure (FYM) reported by Channappagoudar [10].

Parthenium hysterophorus from different geographical regions exhibited parthenin, hymenin, coronopilin, dihydroisoparthenin, hysterin, tetraneurin and hysterophorin. The principal constituents of their sesquiterpene lactones [11]. Gupta *et. al*. [12] identified a novel hydroxyproline-rich glycoprotein as the major allergen in P. hysterophorus pollen. Das *et. al*. [13] examined the flowers of *P. hysterophorus* and isolated four acetylated pseudoguaianolides along with several known constituents. The decoction of *P. hysterophorus* has been used in traditional medicine to treat fever, diarrhoea, neurologic disorders, urinary tract infections, dysentery, and malaria and as emmenagogue [14].

The purpose of the acute-lethal toxicity is to determine lethal toxic effect of a toxicant within a short duration of usually 96 hours or 4 days on a particular tested organism. The acute-lethal toxicity test with fish species is to help in the assessment of possible risk to similar species in natural environment [15]. Acute-lethal toxicity test can be done in the laboratory using static, semi-static and renewable methods as the case may be. Plant extracts are referred to as botanicals and when poisonous to fish is called piscicides[16]. The use of toxic plants for catching fish is a common practice worldwide. Toxicity can be measured by its effects on the target (cell, tissue, organ and organism,). Because individuals characteristically have diverse levels of response to the same dose of a lethal substance, a population level measure of toxicity is often used which relates the possibilities of an outcome for a given individual in a population. One such measure is the LD50. The toxicity of any pollutant is either acute or

chronic. The chronic studies include both histo-chemistry and pathology.

Test solutions should be renewed with the original biocide (toxicant) solution prepared at the start of the test [17]. The acute-lethal toxicity test at times, however, is used alongside other techniques such as histopathology, haematology and bioaccumulation for a better comprehension of the impact of the toxicant on the test organism [18]. Acute toxicity is expressed as the median lethal concentration (LC50) that is the concentration in water which kills 50% of a test batch of fish within a continuous period of exposure which must be stated [19]. The use of 96-h, LC50 has been widely recommended as a preliminary step in toxicological studies on fishes ([15, 20-23]. The use of toxic plants for catching fish is a common practice worldwide.

Histopathology is the microscopic evaluation of disease processes [24]. It is a very powerful, subjective tool which may be used to establish primary and secondary disease patterns in populations of fish. Most biomarkers are narrow in their expression whereas pathology is broad in its evaluation [25]. Histopatholoigcal changes in animals tissues are powerful indicators of prior exposure to environment stressors and are net result of adverse biochemical and physiological changes in organisms. Histopathological effects of fish poisons on different organs of fish lead to know about the impact of poisons on the ecosystem. The tissues of fresh water fishes show various responses when exposed to toxicants [26]. According to [27] damages of tissue vary with nature of toxicants, medium and duration of exposure. The toxic materials accumulate in the body systems and cause disorder, which ultimately may lead to death of the organisms. In Bangladesh, some research works had been reported on histopathological effect of toxicants in various organs of fishes [28-30].

In the present study, an attempt has been made to observe possible haematological and histological changes vital tissue kidney of the fish *Labeo rohita* exposed to sub-lethal and concentrations of plant *Parthenium hysterophorus* extract.

The teleost kidney is one of the first organs to be affected by contaminants in water [31] and appears to be particularly sensitive to a variety of toxins due to the high renal blood flow, the ability to concentrate substances, and the biotransformation of the parent compound to a toxic metabolite [32]. The kidney plays the major role in this fight, producing large quantities of diluted urine. Although the kidney does not possess high levels xenobiotic metabolizing enzymes as does the liver, many of the enzymatic reactions occurring in the liver have been shown to occur in the kidney [32]. It receives the bulk of the post branchial blood flow and kidney tissue is of importance in the detoxification and elimination of aquatic contaminants in fish [33].

Methodology

Labeo rohita fish were collected from Nal .Damayanti Dam,local fish market Amravati washed with 10% solution of Potassium Permagnate to free any fungal infections. Then acclimatized to the laboratory condition for fifteen days in large aquarium. The fish size15 to 20 cm in length and weight 150 to 200 gm. Fishes maintained in well water and its physico-chemical characteristics analyzed following the method given in APHA [21]. Fishes fed with add libitum food, oil cake and rice bran to keep them more or less in the same state of metabolic requirement.

A group contain ten fishes were taken in both container experimental and control respectively. The dose starting from 10 ml in 10 lit. Well water. The dose increased daily by 10 ml. Their behavioral changes recorded daily and throughout the exposure period. Everyday water change to maintain the concentration of *Parthenium hysterophorus* extract and histological changes were recorded.

Results and Discussions

For lethal concentration at control there are no lesion, no necrosis, no pigments, no malignancy, no inflammation and cellular degradation seen for the 24hrs, 48hrs, 72hrs,

and 96hrs. At 4.00ml/l lesion occurs on bowman's capsule and renal tubule for 24hrs, for 48hrs lesion, inflammation on bowman's capsule and proximal convoluted tubules while, for 72hrs pigments occurs in glomerulus and lesion and inflammation on renal tubules and for 96hrs lesion and pigments occurs on bowman's capsule and renal tubules. At 5.00ml/l lesion on proximal and distal convoluted tubules for 24hrs, for 48hrs lesion, pigment occurs on proximal and distal convoluted tubules while, for 72hrs necrosis occurs in glomerulus and for 96hrs malignancy and necrosis occurs on glomerulus while, lesion, necrosis on proximal and distal convolulated tubules.

The kidney of fish exposed to lethal concentration for different time exposure (24hrs. 48hrs. 72hrs. and 96hrs.) showed lesion, inflammation, pigment and necrosis of Bowman's capsule, Glomerulus and renal tubule during low concentration while, increasing concentration for different time exposure showed necrosis, malignancy and cellular degeneration were seen at later time of exposure.

In the present work, shows inflammation, pigments, lesions and necrosis of Bowman's capsule, Glomerulus and renal tubule. Such observation was also reported by [34], found swollen Bowman´s capsule cells and melanomacrophages in the kidney of trout (Salmo trutta) and tilapia (Oreochromis mossambicus) exposed to mercuric chloride. Rosety *et al.*[35] studied the sodium dodecyl sulfate induced histological changes in the kidney of Sparus aurata at 5, 8.5, 10 and 15 ppm. shows loss of normal structure with tubular and renal corpuscle retraction in kidney. His findings agree with the present work. Tilak *et al*.[36], noticed sever necrosis, cloudy swelling in the renal tubules, cellular hypertrophy, granular cytoplasm and vacuolization in kidney tissues of Ctenopharyngodon idella after exposure to fenvalerate. In the present study such result is observed. This finding was observed in the kidney tissues of fish exposed to delyamethrin by Cengiz [37].

Kidney (Section) of Labeo rohita exposed to lethal concentration (control) of root water extract of Parthenium hysterophorus.

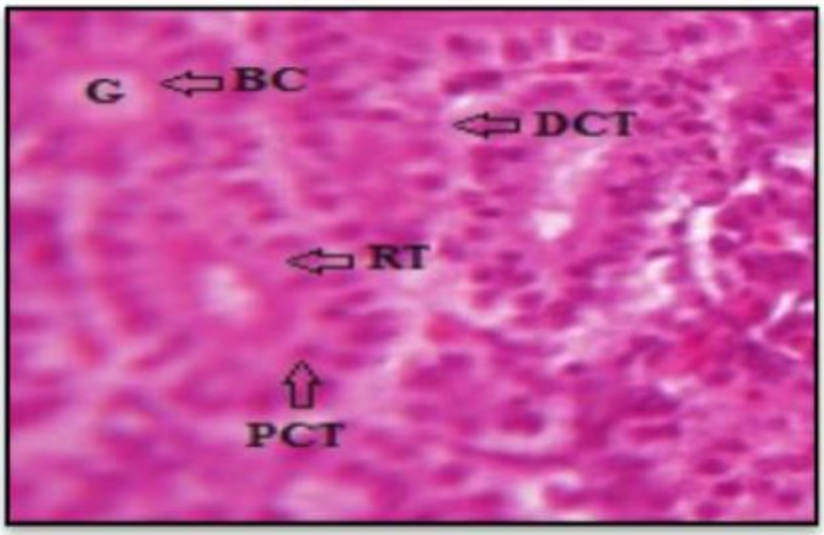
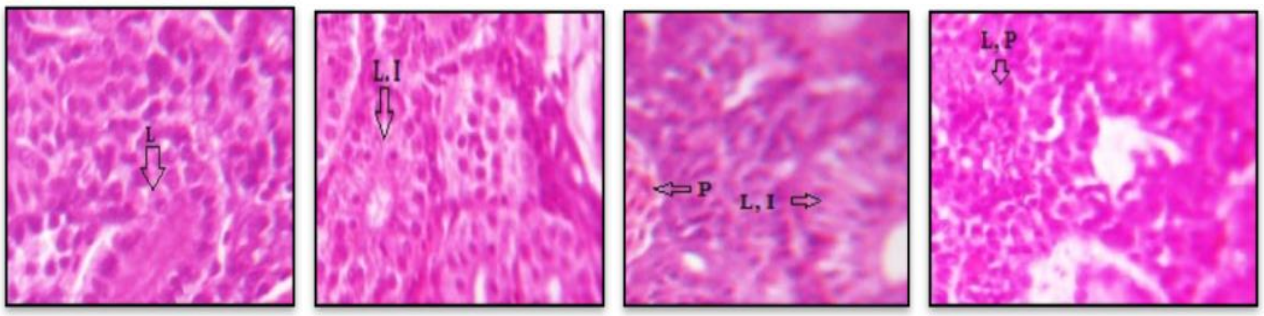
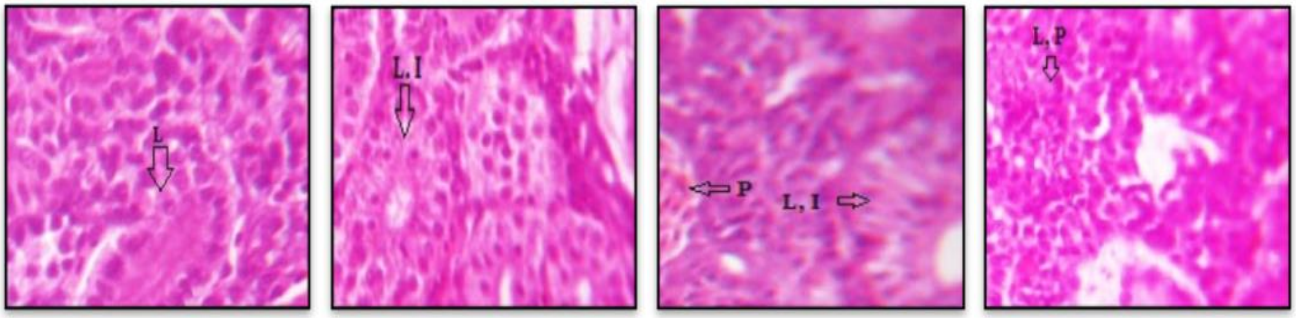


Fig. - Kidney of ***Labeo rohita*** **(Control).**
BC: Bowman's capsule, G: Glomerulus, RT: renal tubule, PCT: Proximal convoluted and DCT: Distal convoluted tubule. No lesion (L), inflammation (I), pigment (P), necrosis (N), malignancy (M) and cellular degeneration(C).



24hrs **48hrs** **72hrs** **96hrs**

Fig: Kidney (Section) of *Labeo rohita* exposed to lethal concentration (4.00 ml/l) of root water extract of *Parthenium hysterophorus* showing lesion (L), inflammation (I) and pigment (P).



24hrs **48hrs** **72hrs** **96hrs**

Fig: Kidney (Section) of *Labeo rohita* exposed to lethal concentration (5.00 ml/l) of root water extract of *Parthenium hysterophorus* showing lesion (L), inflammation (I), pigment (P), necrosis (N) and malignancy (M).

Conclusion

The kidney of fish exposed to lethal concentration for different time exposure (24hrs. 48hrs. 72hrs. and 96hrs.) showed lesion, inflammation, pigment and necrosis of Bowman's capsule, Glomerulus and renal tubule during low concentration while, increasing concentration for different time exposure showed necrosis, malignancy and cellular degeneration were seen at later time of exposure.

Conflicts of interest: The authors stated that no conflicts of interest.

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