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RESEARCH ARTICLE

STUDY ON HISTOPATHOLOGICAL CHANGES IN KIDNEY OF *HETEROPNEUSTES FOSSILIS EXPOSED TO NEEM (AZADIRACHTA INDICA)*

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ABSTRACT

Freshwater catfish *Heteropneustes fossilis* was exposed to sublethal concentration of *Azadirachta indica* for a period of 24, 48, 72 and 96 hours. The normal kidney of fish showed perfect nephron with interstitial lymphoid tissue but after exposure to *NEEM (Azadirachta indica)* a Biopesticide, showed the apparent damage in renal tubules along with disintegration of the cytoplasmic material in the epithelium., Glomerular shrinkage, Increased tubular lumen, Pycnotic nuclei, vacuolization as well necrosis.

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INTRODUCTION

Pesticides are major cause of concern for aquatic environment because of their toxicity, persistency and tendency to concentrate in organisms as they move up the food chain, increase their toxic effects to fauna. These pesticides pose a serious threat to the aquatic organisms bring a change in the cellular functions and affect the vital physiological and biochemical functions of the fishes (Ayotunde *et al.,* 2005). Ecologically pesticide and herbicides have created two major serious problems, which were not previously anticipated. In the first place many of them have persisted and accumulated in the environment and have harmful effects to numerous animals and secondly many of them have directly or indirectly affected to the human health. Acute toxicity may result in severe damage to the components of nature. Hence it is essential to evaluate the hazard associated with the use of specific pesticide in the aquatic environment (Ayotunde and Ofem 2005). A chemical pesticide is target specific and leaves deleterious impact on the environment (Tilak and Koteswara Rao 2003). To overcome the problems of synthetic chemical hazards, one of the best controls measured is the use of plant origin products *i.e* "Biopesticide". The popularity of the plant products are increasing day by day because of their biodegradability, least persistence and least toxic to non-target organisms with economic and easy availability (Ayuba and Ofojekwu 2000).

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Azadirachta indica is medicinal plants are part and parcel of human society to combat diseases, form the dawn of civilization and it is one of the most promising natural compounds, where it is less harmful to the environment than the synthetic pesticides. Maximum pesticidal activity is in seed kernel which has been tested for biological effect as repellent, feeding and ovipositon deterrent, growth regulators and sterillant effect. It is also reported to have toxicity and imparts egg. hatchability (Bais and Arasta 1995, Satyanir and Yavad 1999).

MATERIALS AND METHODS

Histo-pathological Studies

Present investigation has been carried out to study the effect of sub-lethal concentration of *Azadirachta indica* on kidney of the freshwater Indian cat fish *Heteropneustes fossilis.* Healthy and sexually mature specimen of *Heteropneustes fossilis* measuring about 15-20 cm length and 50-100 gm in weight were selected for the experimental study. These collected fishes were maintained in glass aquaria containing tap water and acclimatized in laboratory conditions at room temperature for one week. The water of the aquarium was changed daily and fishes were fed daily with commercial fish food. Fishes are starved for 24 hours prior to the experiment and are not fed during the period of experiment (Dalela *et al.,* 1979). In this experiment, the specimens were kept in two experimental groups. Control Group and Experimental Group Each group was exposed to sublethal concentration of the *Azadirachta*

indica similar set up was also maintained as control. The animals were scarifies for optimal concentration of biopesticide (*Azadirachta indica*) for different exposure of 24, 48, 72 and 96 Hrs. For histological studies, fishes were scarified during the exposure period of 24, 48, 72 and 96 Hrs respectively. The toxicant was renewed after fixed period. . The technique of MICROTOMY is being used for the histological study purpose of kidney of the fresh water catfish *Heteropneustes fossilis.*

RESULTS

Normal Kidney: The normal kidney shows perfect nephron with interstitial lymphoid tissue. The renal corpuscles and kidney tubules (KT), proximal convoluted tubules (PCT) are intact. The glomerulus (G) surrounded by Bowman's capsule (BC) and the endothelial cell covering glomerulus were in normal condition. The haemopoietic tissue (HPT) in intertubular spaces has parenchymatous cells with distinct pycnotic nuclei (PN).

24 hrs.Kidney: No apparent damage was seen in renal tubules after 24 hours exposure of the fish. Kidney showed Disintegration of the cytoplasmic material in the epithelium, increase in space between glomerulus and bowman's capsule (SP), Glomerular shrinkage (GS), Increased tubular lumen (TL), Pycnotic nuclei (PN) as well Necrosis (N).

48 hrs.Kidney: At 48 hours of exposure, kidney showed collapsing glomeruli (CG), necrosis of glomeruli (NG), necrosis (N), vacuolization (V), increase pycnotic nuclei (PN) and there were increase in space between glomerulus and bowman's capsule (SP). The tubular cells have undergone hypertrophy and some of the renal tubules have lost their normal shape.

72 hrs.Kidney: At 72 hours of exposure to *Azadirachta indica,* in kidney proximal tubules showed vacuolated cells and vacuoles (V) were noticed all around the sections. Increased tubular lumen (ITL), necrotic proximal tubule (NPT), increased pycnotic nuclei (IPN) and destruction of renal tubule (DRT) has been observed.

96 hrs.Kidney: At 96 hours exposure of *Azadirachta indica* on fish, kidney showed vacuolar degeneration of glomeruli (VDG),thickened bowmen's capsule (TBC) membrane, renal tubule (RT) with degenerated epithelial and occlusion lumen forming vacuolization (V) and necrosis (N) that all leading to destruction of tubule architecture.

DISCUSSION

The normal kidney of fish showed perfect nephron with interstitial lymphoid tissue but after exposure, the apparent damage was seen in renal tubules along with disintegration of

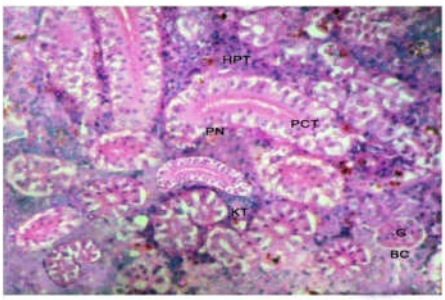

Fig:- Normal Kidney

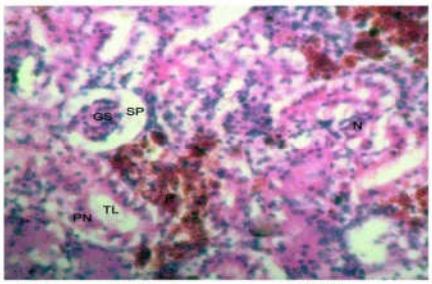

Fig:- 24 hours Kidney

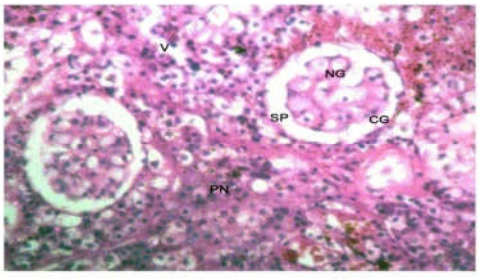

Fig:- 48 hours Kidney

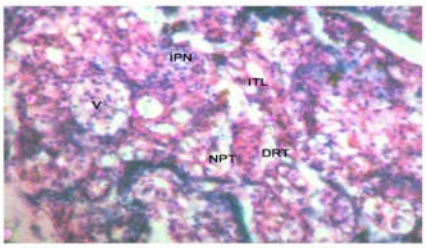

Fig:- 72 hours Kidney

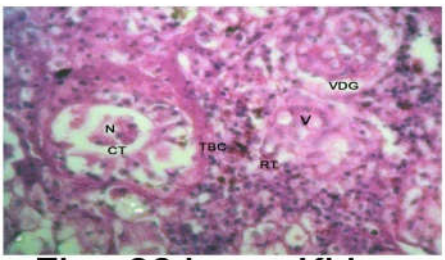

Fig:- 96 hours Kidney

Figures shows the effects of *Azadirachta indica* on Kidney of *Heteropneustes fossilis*

the cytoplasmic material in the epithelium, increase in space between glomerulus and bowman's capsule, Glomerular shrinkage, Increased tubular lumen, Pycnotic nuclei, vacuolization as well necrosis. The kidneys are serving several essential regulatory roles in fish. The kidney participates in whole-body homeostasis, regulating acid-base balance, electrolyte concentrations, extracellular fluid volume, and blood pressure. Many of the kidney's functions are accomplished by relatively simple mechanisms of filtration, reabsorption, and secretion, which take place in the nephron (Raja *et al.,* 2010). Filtration, which takes place at the renal corpuscle, is the process by which cells and large proteins are filtered from the blood to make an ultrafiltrate. Reabsorption is the transport of molecules from this ultrafiltrate and into the blood. Secretion is the reverse process, in which molecules are transported in the opposite direction, from the blood into the urine. (Glodny *et al.,* 2009, Zhou *et. al.,* 2009). It suggest the toxic nature of used biopesticide which is in well agreement with previous studies of Veiga, (2002), Das *and* Murjani (2002), Hassanein *et al.* (2006) and Camargo and Martinez (2007).

Conclusion

The kidneys are serving several essential regulatory roles in fish. The kidney participates in whole-body homeostasis, regulating acid-base balance, electrolyte concentrations, extracellular fluid volume, and blood pressure. Many of the kidney's functions are accomplished by relatively simple mechanisms of filtration, reabsorption, and secretion. *Azadirachta indica* has several medicinal values as well having utility like biopesticide but its exposure showed adverse effect on the kidney of fresh water cat fish *Heteropneustes fossilis*.

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