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Histopathological impact of carbofuran on the liver of fresh water fish *Tilapia niloticus*

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Abstract
Carbofuran is a carbamate class of pesticide widely used as an insecticide in agricultural field throughout Kerala. The present investigation is focused on the effect of sublethal concentration (3ppm) of carbofuran toxicity in the liver of fresh water fish *Tilapia niloticus* for thirty days with parallel untreated control. No histopathological effects were observed in control group. Exposure dependent alternations like haemorrhage, blood spilling, dissociated hepatocytes, granular cytoplasm, necrosis, dilation of sinusoids and degeneration of parenchymatous cells were observed in the liver cells.

Keywords: Carbofuran, *Tilapia niloticus*, toxicity, histopathology

Introduction
Pesticides in general are used very extensively in agriculture, forestry, public health and in veterinary practices. Hence it is necessary to study the immediate and chronic effects of pesticides on fish, which form a part of human diet. These compounds have a tendency to accumulate in small quantities in lower fish food organisms and ultimately biomagnify themselves in the fish species. Therefore, it would be very pertinent to study the effect of such chlorinated hydrocarbons on long-term exposure by chronic studies to ascertain the residual toxicity [1]. Carbofuran (2,3, dihydro-2, 2-dimethyl-7-benzofuranyl methyl carbamate) is one of the most toxic pesticide commonly used as an insecticides in various agricultural fields of Kerala for the control of foliar feeding insects such as corn root worms, wire worms, boll weevils, mosquitoes, aphids, mites, nematodes in soil etc. The wide spread use of these pesticidal residues has been detected in our environment [2, 3]. Review of available literature on fish and associated environmental pollutants indicate that the sublethal doses of most of the pesticides cause varying extent of histopathological injuries to different organs in fishes; the amount of damages are usually dependent on dose, duration of exposure and type of pesticide [1, 4, 5].

Materials and Methods
Same sized healthy *Tilapia niloticus* (both male and female) is used for the experiment. The fishes were introduced into the aquarium for acclimatization under laboratory condition for 10 days. Carbofuran purchased from local pesticide shops were used for LC50 study. The test where performed in standard size glass aquariums. The LC 50 was determined by Probit analysis method. The 24 hrs of LC 50 value was found to be 6.422 ppm, 48 hrs 7.493 ppm, 72 hrs 7.831 ppm and 96 hrs 7.952 ppm. The sublethal concentration of carbofuran used for the present experiment was 3 ppm. The test fish were kept in the test solution of known concentration for a period extending 30 days. After every 24 hours fresh test solution was introduced. The experiments were run in replicates and also with control groups. The test and control group fishes were sacrificed in alternate days like 2nd day, 10th day, 15th day, and 30th days, liver is dissected out, fixed in Bouin's fluid, preserved and processed for histological analysis. Only the photographs indicating well pronounced histopathotogical changes have been included in this paper.

Result and Discussion
The liver is the main organ for detoxification that suffers serious morphological alterations in fish exposed to pesticides [6, 7]. Alterations in the liver may be useful as markers that indicate prior exposure to environmental stressors. No histopathological changes were observed in the liver of the control fish. The structural details of the gill of control *Tilapia niloticus* is shown

in plate 1. Control fish liver shows normal architecture with hepatocytes which where polygonal in shape each with a centrally placed rounded nucleus with distinct nucleolus filled with fine and clear cytoplasm. The hepatic cells are arranged in normal configuration. Kupffer cells were present in the luminal surface of sinusoid endothelium and fat storing cells such as macrophages, pericytes are seen in normal. The parenchymatous hepatic tissue in teleost has many important physiological functions and also detoxification of waste products as well as externally derived toxins, drugs, chemicals, heavy metals and pesticides [8]. From the present study it can be seen that the exposure of carbamate pesticide creates histopathological lesions. The two days of exposure of carbofuran creates histopathological changes in the form of haemorrhage (Plate 2), haemorrhage and blood spilling were observed in ten days of pesticide exposure (Plate 3), blood spilling, dissociated hepatocytes, and granular cytoplasm were observed in the 15 days of pesticide exposure (Plate 4). The long term exposure of pesticide period i.e. 30 days (Plate 5) shows complete loss of normal configuration of liver cells such as necrosis, degeneration of parenchymatous cells, dilation of sinusoid were reported. There are many workers revealed that Carbofuran exposure on fish is very toxic. Bio accumulation of carbofuran higher in the brain, liver and ovary and it inhibit oocyte maturation condensation of spermatogenic cells in testis and inhibit the growth rate and create hormonal imbalance. The long term exposure of pesticide creates health hazards in fish species, absorb chemicals and it disturbs haematological and metabolic process by inhibit enzymatic activities and cause tissue damage [9]. Cloudy swelling, bile stagnation, focal necrosis, atrophy and vacuolization have been reported in the *Corydoras paleatus* exposed to methyl parathion [1, 7]. Hyperplasia, vacuolation, disintegrated blood vessels, disrupted hepatocytes, focal coagulative necrosis, disorganized hepatic canaliculi were observed in *Labeo rohita* exposed to cypermethrin[1,10]. Hepatic lesions in the liver tissues of fish *Gambusia affinis* exposed to deltamethrin were reported such as hypertrophy of hepatocytes, increase of Kupffer cells, circulatory disturbances, focal necrosis, fatty degeneration, nuclear pycnosis, narrowing of sinusoids [1, 11]. All the histopathological observation indicated that exposure to sublethal concentrations of carbofuran caused destructive effect in the liver tissues of *Tilapia noliticus*. Histopathological alterations such as those observed in this study and findings from previous studies could result in severe physiological problems, ultimately leading to the death of fish.

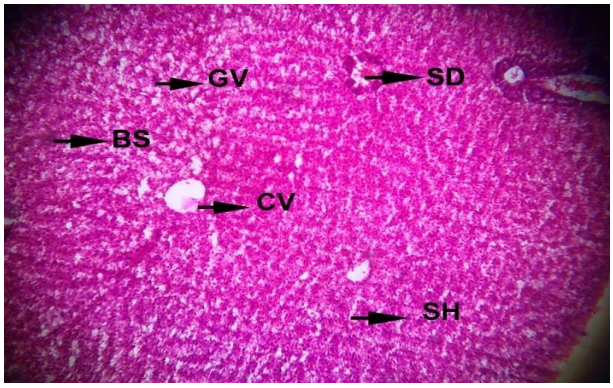

Plate 1: Liver of Control fish (GV - Glycogen Vacuole, SD-Sinusoid, BS - Blood Sinusoid, SH -Sheet of Hepatocytes, CV - Central Vein)

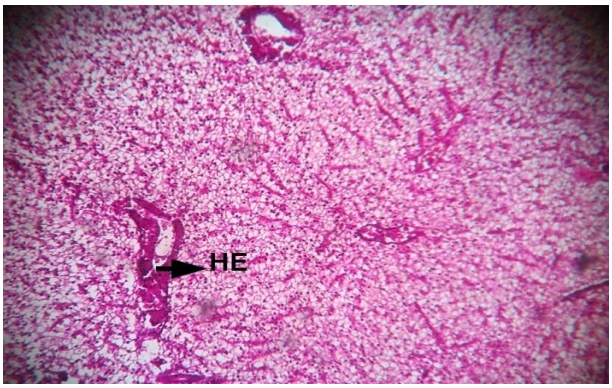

Plate 2: Liver of 2 Days of Pesticide Exposure (HE -Haemorrhage)

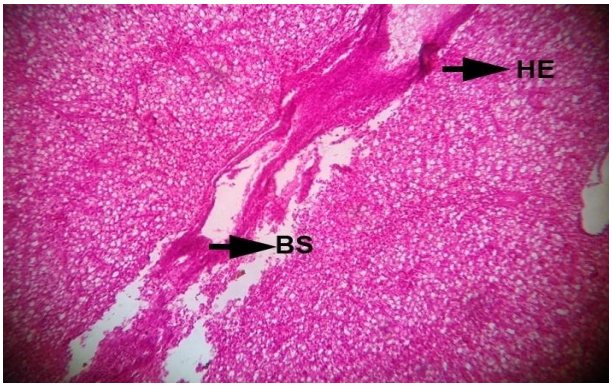

Plate 3: Liver of 10 Days of Pesticide Exposure (HE - Haemorrhage, BS -Blood Spilling)

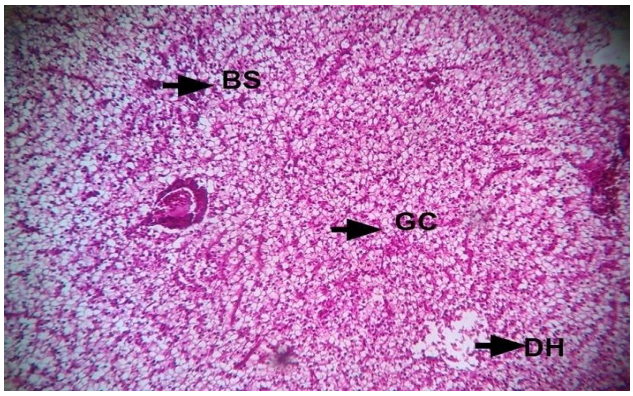

Plate 4: Liver of 15 Days of Pesticide Exposure (BS - Blood Spilling, DH - Dissociated Hepatocytes, GC - Granular Cytoplasm)

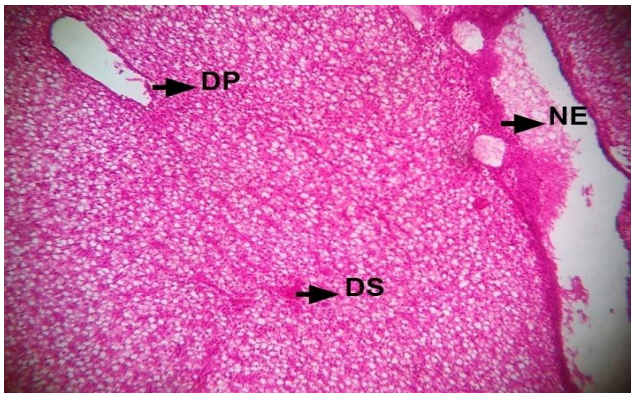

Plate 5: Liver of 30 Days of Pesticide Exposure (NE - Necrosis, DP - Degeneration of Parenchymatous Cells, DS - Dilation of Sinusoid)

Conclusion

The findings of the present histological investigations demonstrated a direct correlation between pesticide exposure and histopathological disorders observed in the liver tissues of *Tilapia niloticus.* The importance of monitoring and preserving the aquatic environment cannot be over emphasized because water provides the life support system for aquatic life and all life forms. Hence the protection of aquatic resources is essential in protecting the entire ecosystem.

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References

1. Shanta Satyanarayan JP, Kotangale Ahana Satyanarayan, Sanyogita Verma. IOSR J Pharm. 2012; 2(6):60-66.
2. Richards RP. Pesticides in ain water in the northern United States. Nature. 1987; 327:12913.
3. Waite DT. Pesticides in ground water, surface water and spring runoff in a small sakastchewan watershed, Environ. Toxicol. Chem. 1992; 11:741-748.
4. Kulshrestha SK, Arora N. Fish and pesticides-histopathological parameters. Intl. J Acad. Ichthyol. 1984; 5:1-9.
5. Mario Pacheco, Maria Ana Santos. Biotransformation, genotoxic and histopathological effects of environmental contaminants in European eel (*Anguilla anguilla* L.). Ecotoxicol. Environ. Saf. 2002; 53(3):331-347.
6. Rodrigues EL, Fanta E. Liver histopathology of the fish *Brachydanio rerio* after acute exposure to sublethal levels of the organophosphate, dimethoate 500. Rev. Bras. Zool. 1998; 15:441-450.
7. Fanta E, Rios FS, Romao S, Vianna ACC, Freiberger S. Histopathology of the fish *Corydoras paleatus* contaminated with sublethal levels of organophosphorus in water and food. Ecotoxicol. Environ. Saf. 2003; 54:119-130.
8. Roberts RJ, Rodger HD. The pathophysiology and systematic pathology (ED. Ronald J. Robert, S) Fish pathology, 3 edn. Harcourt publishers limited. 2001; 88.
9. Dogil T, Vengayil, Jyothy Singh, Aiswarya Luxmi Singh, Das VK. Bioaccumulation on carbamate and pyrethroid insecticides in fishes of the River Gomti at Jaunpur during breeding season. J Ecophysiol. Occup. Hlth. 2011; 11:1-8.
10. Sarkar B, Chatterjee A, Adhikari S, Ayyappan S. Carbofuran and cypermethrin induced histopathological alterations in the liver of *Labeo rohita* (Hamilton) and its recovery. J Appl. Ichthyol. 2005; 21:131-135.
11. Cengiz EI, Unlu E. Sublethal effects of commercial deltamethrin on the structure of the gill, liver and gut tissues of mosquito fish, *Gambusia affinis*: A microscopic study. Environ. Toxicol. Phar. 2006; 21:246-253.