ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 07 | July - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

"EFFECT OF CADMIUM NITRATE ON HISTOPATHOLOGY OF GILL OF FISH CHANNA PUNCTATUS."

Zoology

S. B. Jadhav Department Of Zoology And Fishery Science, Dayanand Science College, Latur.

ABSTRACT

This study was carried out on fish channa punctatus to investigate the effect of lethal concentration of cadmium nitrate on histopathological study of gill compare to control one.
96 hr. Lc_{50} for cadmium nitrate is 0.57 ppm. Which is toxic to fish gill showed marked changes. After exposure to toxic cadmium nitrate at 96 hr. LC_{50}.

KEYWORDS

Pollution, cadmium nitrate, Histopathology, Gill, Channa Punctatus

INTRODUCTION:

Histological analysis is a one of the technique to assess the sensitive parameter and is crucial in determining cellular changes that may occur in target organs, such as gills, liver and gonads (Datta, 1996) some of the heavy metals are necessary for specific bodily functions due to their nutritional value but the highest concentrations of these metals causes toxic effect within an organism. These toxic concentrations of metal may very to specific for the specific species of aquatic organism. This variation has been seen in mammals but also seen in various fish species.

Meyers Hendricks (1982) studied on the heavy metals substances are harmful to fish at very low concentration heavy metal pollution in aquatic ecosystem, especially river systems, is a major environmental concern, It is therefore necessary to investigate not only the possible organism and population response to heavy metal pollution, but also underlying cause of specific response, for example histological alterations or damage caused by the specific exposure.

MATERIALAND METHOD:

The selected model animals the freshwater fish channa punctatus were collected from yeldari dam parbhani district. After collection the fishes were acclimatized in the laboratory condition of room temperature for 2-3 days. The active acclimatized fishes of approximately same size were selected for experiment.

Before starting the experiment these fishes were divided into two groups one group of fishes was maintained as control while the second groups was exposed to chronic dose of cadmium nitrate 96 hrs. LC_{50} 0.57 ppm.

Processing Of Tissues For Histopathological Studies.

The tissue removed from the test fish washed in 0.90% saline solution for two times for remove blood or debris attached on external surface. The tissues were then cut into small pieces of approximately 3-5 mm.

Fixation of Tissues :-

The aim of fixation is the preservation of cells and tissue, existing during life, prevention of autolysis, loss of easily diffusible substances by appropriate coagulation. Tissues were fixed in Bouine's fluid. The tissue was kept in fixative for 6-24 hrs. (Drury and wallington, 1980)

Post Fixation Process :-

After fixation of tissue washed three times in clean cold water to remove yellow colour.

Dehydration :-

Ascending grades of aquous ethyl alcohol beginning with 30%, 50%, 70%, 90% and absolute alcohol. Then clean with xylene for 2 min. and transferred in xylene + melted paraffin mixture (1:1) for one hour. Tissues were transferred in to melted paraffin at room temperature till solidification (Drury and Wallington, 1980).

Embedding:-

To lubricate a thin layer of glycerol was placed in cavity. Melted wax was poured and allowed to stand for sometimes with warm forceps tissues were taken and put in the middle cavity. Which then placed in cold water and blocks were removed. Surplus wax was cut from sides.

Section Cutting :-

5 um thicknesses of sections were selected in the form of ribbons of 10-15 cm in length.

Mounting :

A mixture of egg albumin and glycerol was smeared very thinly on slide before mounting. Section was gently lowered onto the water surface (5.10^{0}C) sections were flattered by gentle heat Drury and Wallington,1980. De-waxing was carried out by giving two washes in xylene for 5 min.

Hydration :-

Sections were run through down grading of alcohol i.e. 90%, 70%, 50%, 30%, alcohol for 2-5 min.

Staining :-

Stained with Haemotoxylin for 15-20 min. Then washed slide under running tap water for 2-3 min. Then quick dip of 0.5 -1% Hcl in 70% alcohol for a few seconds. Then stained the slide in 1% aqueous Eosin for 1-3 min. slide was dipped in 90% and 100% alcohol for a few minutes.

Mounting:-

For drying and preservation slides were kept at room temp. for 3-4 days.

Microphotographs Of Slides :-

After 4 days, mounting slides were used for microphotographs, done by binocular microscope (Labomed LX-400) with attached camera ivu 5100 labomed.

RESULTS:-

In the present investigations, histopathological studies of gill on fish channa punctatus were done in fishes exposed to 96 hours LC_{50} of cadmium nitrate. The histological changes were noticed in gill. The histological changes in the tissues of exposed fishes were compared with that of the control fish.

Histological Study Of Gill : (Control)

The gills, which participate in respiration, osmoregulation and excretion, remain in close contact with external environment and particularly sensitive to changes in the quality of the water are considered the primary target of the contamination.

The histological structure of normal gill composed by the presence of stratified epithelial cells, primary gill lamellae, secondary Gilllamellae, Inter lamellar distance and gill arch were observed. (Fig. No. A)

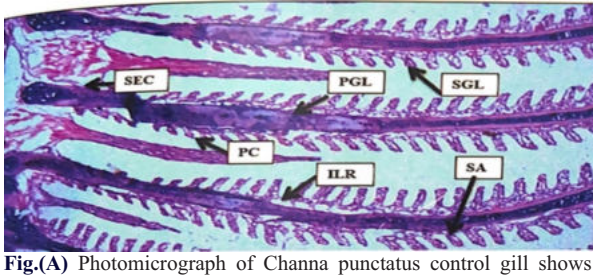

Fig.(A) Photomicrograph of Channa punctatus control gill shows

Stratified epithelial cells (SEC), Primary gill lamellae (PGL), Secondary Gill lamellae (SGL), Inter lamellar distance (ILR) and Pillar cells (PC) Control Gill H/E-100X

Histopathology Of Gill (Experiments) :-

The fish exposed to lethal concentration of cadmium nitrate for 96 hours at 0.57 ppm gill showed marked degenerative changes in architecture of gill bulging tip of primary gill lamellae, hemorrhage, degeneration of secondary gill lamellae, degenerated satisfied epithelial lining, thinning of secondary gill lamellae fusion of secondary gill lamellae and epithelial hypertrophy. Discolorations of the skin compared to the control. Pale and discolored slightly swollen gills were seen compared to their normal reddish and healthy appearance in control fish (Fig. No. B)

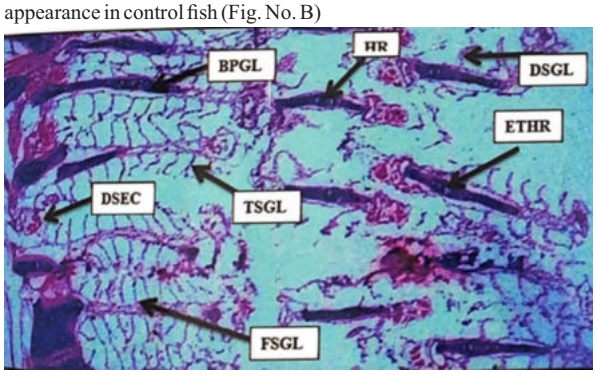

Fig. (B) Photomicrograph of Channa punctatus gill after exposed to cadmium nitrate at 96 hours shows Bulging tip of primary gill lamellae (BPGL), Hemorrhage (HR), Degenerated Secondary gill lamellae (DSGL), Degeneration of secondary gill lamellae (DSGL), Degenerated stratified epithelial lining (DSEC), Thinning of secondary gill lamellae (TSGL), Fusion of Secondary gill lamellae (FSGL) and Epithelial hypertrophy (ETHER) H/E-100X

DISCUSSION:

Hadiand alwan (2012) studies on histopathological changes gill of fresh water fish, TilaPia zillii, exposed to aluminium and observed that the gills shows a typical structural organization of the lamellae in the untreated fish and treated fish with aluminum gill shows cellular hypertrophy or hyperplasia in the epithelial layer of primary filaments and fusion of secondary lamellae, epithelial lifting, interstitial edema and blood congestion in then vascular axis of primary filaments. In addition, a few telangiectasia were also observed at gill lamellae. The 100 ug aluminum/liter showed that caused cellular degeneration which result in necrosis of gill epithelial tissues.

Usha Rani (1999) reported histopathological changes in gills exposed to cadmium of oreschromis mossambicus and state that the gills serve as sensitive bioindicator of metal pollution in aquatic medium and pathological studies in turn reveal the extent of pollution as heavy metals selectively damages a particular organ.

Heath (1987) stated that the gills are significant organs for respiration and osmoregulation. It is possible that the damage of gills could be a direct result of the salts, heavy metals, pesticides, sewage and fertilizers which are conveyed to the water (Temmink, et.al. 1983). Directly exposed to poisons occurring in external environment which often cause pathology in fish (Mallatt, 1985).

CONCLUSION

Histopathological alterations in tissues studies induced lethal concentration of cadmium nitrate for 96 hr. were found to be dose dependent. These heavy metals toxicity to change the histoarchitecture of tissues. Since gills are in direct contact to the toxic medium maximum damage was observed in this tissue.

The fish exposed to lethal concentration of cadmium nitrate for 96 hours at 0.57 PPm, gill showed marked degenerative changes in architecture of gill bulging tip of primary gill lamellae, hemorrhage, degenerated secondary gill lamellae, degenerated stratified epithelial lining, thinning of secondary gill lamellae, fusion of secondary gill lamellae. And epithelial hypertrophy. Discolorations of skin compared to the control pale and discolored slightly swollen gills were seen compared to their normal reddish and healthy appearance in control fish (Fig B).

REFERENCES:-

1. Datta, H.M. (1996) :- A composite approach for evaluation of the effects of pesticides on fish In : Fish morphology (J.S.D. Munshi and H.M. Datta, eds). Science Publisher Inc. India.
2. Meyers, T.R. and Hendricks J.D. (1982) : A summary of tissue lesions in aquatic animals induced by controlled exposures to environmental contaminants chemotherapeutic agents, and potential carcinogens. Marine fisheries Review, 44: 1-17 pp.
3. Drury R. A.B. and Wallington E.A. (1980) : carleton's Histological Technique. Oxford University press, United kingdom. 127 : 44 -55 pp.
4. Hadi and Alwan (2012): Histopathological Changes in gills, liver and kidney of fresh water fish, Tilapia Zilli, Int. J. of pharm. And Life Sci (IJPLS),(3) 11: 2071 -2081 pp.
5. Usha Rani (1999) : pathological observations in gills of the freshwater teleost oreochromis mossambicus (Tilapia) with reference to cadmium toxicity. Indian Journal of comparative Animal physiology, 17(1) : 18-22 pp.
6. Heath, A.G. (1987): Water pollution and fish physiology. CRC Press, Florida.
7. Temmink, J. Bouweister p, De Jong p. and Van Den Bern. J. (1983) : An Ultrastucture of chromatin induced hyperplasia in the gill of rainbow trout, salmo gairdneri. Aquatic toxicology, 4, 165 – 179 pp.
8. Mallatt J. (1985) : Fish gill Structural changes induced by toxicants and other irritants, a statistical review. Canandian Journal of fisheries and Aquatic Sciences, 42, 630 -648 pp.