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FURADAN EFFECT UPON HISTOPATHOLOGY OF OVARY IN THE FRESHWATER FISH *Channa punctatus* (Bloch)

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ABSTRACT

The furadan exposure with sub-lethal concentration affects upon ovary of freshwater fish, Channa punctatus were investigated. There ovary morphology and anatomy changed in minor and major exposure resulted as reduction in size of mature oocytes, disruption, vacuolization in cytoplasm in acute and complete loss of normal configuration of ovary, necrosis, elongated ovarian follicles, and fragmented ova with abnormal shape under chronic exposures during chronic exposures observed during study period.

Keywords: Histopathology, Oocyte, *Channa pucntatus,* furadan, Sublethal.

INTRODUCTION

The freshwater ecosystem is presently being contaminated with toxic chemicals from industrial, agricultural and domestic disposal systems. The water resources are generally polluted with a variety of chemicals as fertilizers and pesticides. Pesticides are the chemicals, which have posed potential health hazard not only to livestock and wild life but also to fish, birds, mammals and even human beings (Naeem *et al*, 2010). These chemicals ultimately resulted into accumulation of undesired materials in the aquatic system which reaches also in fish tissue (Bondarenko et al, 2009) in certain instances where it can reduce reproductive success by direct interaction with the gonads and germ cells. Aquatic organisms, including fish, accumulate pollutants directly from contaminated water and indirectly via food chain1.

The histopathology deals with the pathological changes induced in the fine structure of body tissue. The abnormal tissue morphology and anatomy is either indication of disease or accumulation of toxic substances like heavy metals and pesticides.

The histopathological is described as important tool for estimating the profound effects of any toxicant at tissue level (Sprague, 1993) . There tissue level changes are used as indicators

about various anthropogenic pollutants on organisms and gives insight of overall health at all trophic levels in the ecosystem. These biomarkers are resulted through stress as several pollutants arise metabolic activation in order to maintain cellular change in the affected organism (Muhammad, 2009).

Furadan is a carbamate pesticide widely used as systematic poison and widely used for the control of sucking pests, thrips, mites and soil-pests (Bondarenko et al, 2009). The carbamate interferes in the normal synaptic transmission and reaches to cholinergic site for the hydrolysis of neurotransmitters. There Acetylcholine inhibition leads to its storage at nerve endings, which cause disruption of nervous activity resulting in excitation, paralysis, and finally the death of fishes.

This insecticide is crucial to aquatic organisms and causes severe metabolic disturbances in non target species like freshwater fishes (Srivastava et al, 2008). The present study was undertaken to evaluate the changes induced in ovarian tissues of *Channa punctatus* exposed to sublethal concentration of furadan for short term (4 days) and long term (15 days) periods.

METHODS AND MATERIALS

The adult *Channa punctatus* fishes were procured from local fish market and carried to laboratory in buckets where treated with terramycin solution (15mg/l), potassium permagnate (2 mg/l) and acclimatized for 10 days with nutrient supply. Water in the aquaria was also changed once in every day.

The LC50 value was estimated as 4ppm malathian for 96 hours on the basis of previous methods (Finney, 1971; Sprague, 1993). Then sub-lethal concentration treated to 4 and 15 days upon 10 fishes, and, separate control groups were maintained for further study. Thereafter, both control and treated fishes

The control and furadan exposed fishes after 4 days and 15 days were removed from water for ovary dissection and fixed into Bouin's solution to 24 hours. This material was washed to discard picric acid and then 6 µm thick paraffin blocks prepared following dehydration and clearing processes through microtome machine. These sections were taken on slides after staining with hematoxylene and mounted in DPX. Then sections were observed under microscope and photographed.

Results and Discussion

In normal condition, the ovary is paired structure consisting ovarian wall, oogonia and oocytes at different maturation stages. Each ovary is surrounded by follicular epithelium. The asynochronous development give rise cystovarian type as large nucleus and small cytoplasm in early stage, while nucleoli number increases during oocyte development and yolk nucleus near the nucleus in first appearance and later migarated to peripheral region where it breaks and disappears in last stage. The nucleus reduced due to vitellogenesis. The egg membranes are poorly developed with presence of atretic follicles in which granulose cells play an important role in phagocytosis. The granulose cells are likely source of strogen and theca cells may be associated with steroid synthesis. The follicular atrwesia may be due to lack of sufficient endogenous gonadotropins (Figure 1).

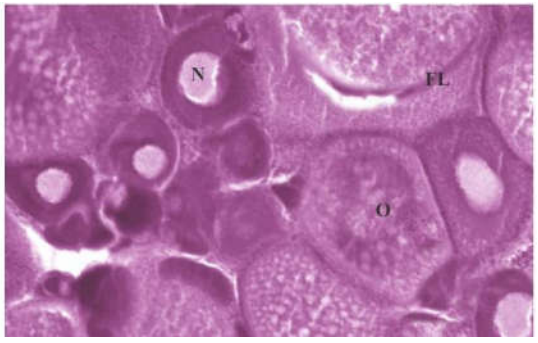

Figure 1: Ovary of control fish *channa punctaus* (N-Nuclus, O- Oocyte, FI- Follicular lining)

The histopathological changes in the ovary of furadan-exposed fishes showed comparatively less number of maturing and matured oocytes with more atretic follicles rather than control condition depending upon exposure periods. The excess atretic follicles appeared due to lack of gonadotropin stimulation which is further confirmed through less

number of gonadotrophs in the pituitary-gonadal axis. Also, the presence of inter-follicular spaces, a gradual shrinkage of oocytes, arrest of follicular development, simultaneous arrest of vitellogenesis ultimately resulted into smaller oocytes.

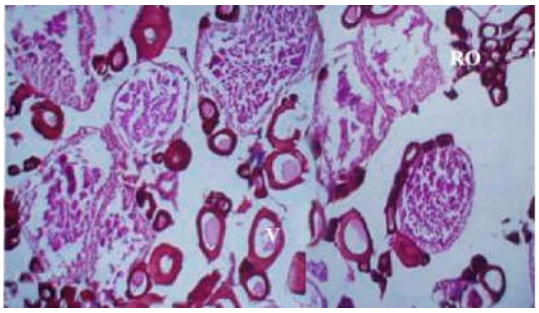

Figure 2: Ovary of *Channa punctaus* with 4 days furadan exposure (Reduced oocyte, V- Vacuolation)

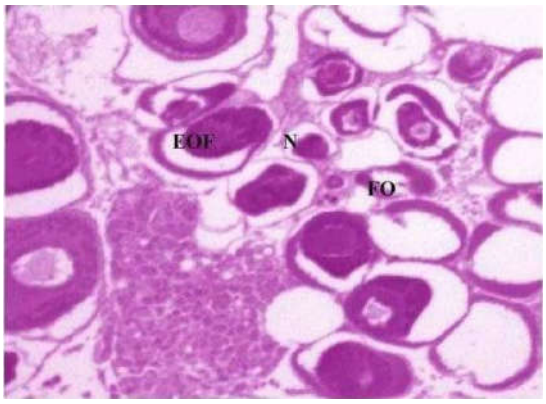

Figure 3: Ovary of Channa Punctatus fish with 15 days furadan exposure
(FO- Fragmented ova, N- Necrosis, EOF- Elongated ovarian follicles)

The acute exposure (for 4 days) showed reduction in oocytes size and cytoplasmic vacuolization during study (Figure 2). The previous study showed alteration in ovary structure due to exposure (Kulshrestha et al, 1984).

The complete loss of ovary structure through necrosis, elongated ovarian follicles, and fragmented ova with abnormal shape were reported in Figure-3. Hazarika and Das (1998) suggested toxicological impact of BHC on ovary of air breathing cat fish *Heteropneustes fossilis* with different exposed concentrations also consistent to present findings. In similar study, marked damage in germinal epithelium, atresia of oocyte, stromal hemorrhage, vacuolization of oocytes and general inflammation were reported (Pandey and Shukla, 1985; Giri et al, 2000). The gonadal impairment in a freshwater fish *Channa punctatus* (Bloch) was reported due to chronic exposure of Devicyprin exposure in the similar laboratory conditions (Srivastava et al, 2008).

This study showed gonadotoxic impact of furadan on ovarian histology of *Channa punctatus* which results in reduced reproductive performance and lastly affecting fish potential in freshwater ecosystems. The abnormal ovary after exposure is not capable to reproductive success and even affecting fish population.

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