REVIEW OF RESEARCH
IMPACT FACTOR : 5.7631(UIF) UGC APPROVED JOURNAL NO. 48514 ISSN: 2249-894X

VOLUME - 7 | ISSUE - 11 | AUGUST - 2018

STUDIES ON BIOCHEMICAL ALTERATION IN LIPID CONTENT OF HEPATIC AND GONALDAL TISSUES OF HETEROPNEUSTES FOSSILIS DUE TO PYRETHROID TOXICITY

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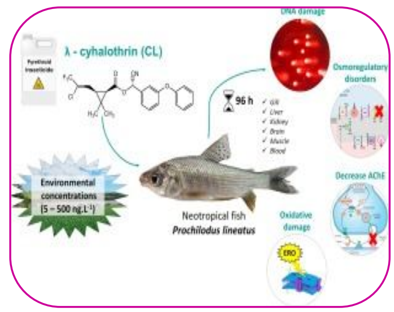
ABSTRACT

The present study focuses on the lipid contents of liver which shows significant increase by 34.02% and 77.13% for subchronic and chronic periods respectively. The gonadal lipid contents showed decline for both the exposure periods. The significant lipid elevation in liver denotes fatty infiltration due to the effect of Permethrin (Pyrethroid) insecticides commercially known as Nix.



KEY WORD: *Gonadal lipid, Permethrin (Pyrethroid) & Liver.*

INTRODUCTION

As earth's population continues to grow, people are putting ever- increasing pressure on the planet's water resources. In a sense, our oceans, rivers, and other inland waters are being "squeezed" by human activities-not so they take up less room, but so their quality is reduced results in alarming water pollution disturbing aquatic eco-harmony. Many pesticides enter in aquatic environment by variety of ways used in agricultural practices. The pesticides pollutant are considered major concern in aquatic ecosystem as it reaches the environment in large amount and its gets concentrated within organism to levels greater than in the environment. Moreover pesticides are persistent in nature and are bio accumulative. The toxicity of pesticides has become mater of biological interest in recent years that great concern has been paid towards chemical pollution when fatal incidence of chemical toxicity came into realization. The pesticides such as organochlorine, organophosphate, carbonate and pyrethroid etc. used in agricultural field which cause serious threat to fish and hence to human beings through good chain. Very scanty information is available with regard to toxic impact of pesticides to fish (Singh, 2002; Pandey 2003; Mukhopadhyay et.al., 2005; Rita and Milton, 2006; Bhutia, et.al., 2013 and Kumari and Kumar, 2016). But a critical review of previous works reveal that most of the works are confined to bioassay and TLM determination and some haematological and histological aspects (Vallee and Ulmer, 1972; Saxena and Parashari 1983 and Srivastava et.al., 1995). In the light of above facts the fish Heteropneustes fossilis has been selected for biochemical study of lipid content of hepatic and gonadal tissue under sublethal concentration Permethrin (Pyrethroid) insecticides for subchronic (15 days) and chronic (30days) exposure periods.

MATERIALS AND METHODS:

A static bio-assay test was done to determine LC_{50} of permethrin to Heteropneustes fossils following the methods of APHA, AWWA and WPCF (1985) and sublethal concentration was calculated by adopting the formula of Hart et.al. (1945). For each experiment the fish (average length 22-24 cm. and weight 38-43gm) were exposed to a sublethal concentration for a period of 15 and 30 days. Side by side a control was also run in equal volume of water (pH 7.6, temp. 34.6^0 C hardness in mg/l as $CaCO_3$ 194.22). The exposure medium was renewed every 24 hours. At the end of exposure period that is on day 15 and 30 the fish were anaesthetized with 1:4000 MS 222 (tricane methane sulphonate Sandoz) and then processed for quantitative estimation. The extraction of total lipid was done as per the method of Floch et.al. (1957). In present study statistical analysis and 't' test (Campbel,, 1974) were done.

RESULTS AND DISCUSSION:

Contrasting results have been obtained as far as the effect of permethrin on the total lipid content of liver and gonad is calculated. The total lipid content increases in liver whereas it depletes in gonads (Table-1).

15 Days Treatment Period (Subchronic):

The liver of the exposed fish shows significant (P<0.01) increase (from 39.73 ± 1.31) in control to 52.87 ± 1.89mg/g wet tissue in treated) in total lipid content. The lipid content corresponds to an increase by 33.07%.

The profiles of total lipid in the ovary and testis have been analyzed to be 26.4 ± 0.83 and 8.56 ± 0.58 mg/g wet tissue in control and 24.0 ± 0.66 and 6.86 ± 0.54mg/g wet tissue in treated ovary and testis respectively. The ovary showed decrease of 9.09 % and the testis by 19.76%. In both the cases lipid content has significantly decreased (P < 0.01).

30 Days Treatment Period (Chronic):

The total lipid content of liver, testis and ovary in control fish has been assessed as 38.88 ± 0.87; 8.35 ± 0.69 and 27.44 ± 0.87 mg/g wet tissue respectively. Similar to 15 days here also lipid content has increased in liver by 75.15% (value being 68.1 ± 1.90 mg/g wet tissue; P < 0.001).

The testis reveals a loss of lipid content by as much 34.61% (value being 5.46 ± 0.46 mg/g wet tissue). Statistically both testis and ovary reveal significant depletion in lipid content at P < 0.01)

Table-1

Alteration in the lipid content (mg/g wet tissue +SE of five fish) in liver, testis and ovary of Heteropneustes fossils following sublethal treatment of permethrin.

Sl.No.	Tissue	Days	Control	Treated	Student 'T' Test P value	& Increase (+) Or Decrease (-)
1.	Liver	15	39.73±1.31	52.87±1.89	<0.01	+33.07%
		30	38.88±0.87	68.1±1.90	<0.001	+75.15%
2.	Testis	15	8.56±0.58	6.86±0.54	<0.01	-19.76%
		30	8.35±0.69	5.46±0.46	<0.01	-34.61%
3.	Ovary	15	26.4±0.83	24.0±0.66	<0.01	-9.09%
		30	27.44±0.87	19.71±0.55	<0.01	-28.14%

In present study liver showed significant elevation in the total lipid level whereas testis and ovary exhibited depletion in its level for both the exposure periods. This reveals that the effect of Permethin on lipid is organ specific of the species. Similar results have been obtained by (Agrawal and Goel, 1981; Rita et.al., 2006 and Rani et.al., 2008). Similar findings have also been observed due to Lead nitrate toxicity on Clarias batrachus (Katti and Sathyanesan, 1983). Observation of literatures reveal that the increasing lipid level under chemical stress is due to fatty infiltration of liver as suggested by Aktar Md. et.al., 2009; Poonam Kumari et.al., 2010 and Amin and Hashem, 2012. However some reports of the decline of lipid content of liver have also been reported under metal treatment. This may be due to chemical variation and mode of action of particular pesticides.

As an explanation of the loss of lipid from gonadal tissue it may suggested that there has been a mobilization of a tissue lipid into the metabolism and the activated lipases may have depleted variation and mode of action of particular pesticides.

As an explanation of the loss of lipid from gonandal tissue it may suggested that there has been a mobilization of a tissue lipid into the metabolism and the activated lipases may have depleted total lipid as suggested by Jha (1992).

Saxena et.al. (1986) studied decreased lipid level of gonad poisoned with biocides in Channa punctatus. Similarly, Ghosh and Chatterjee (1988) have also observed depletion in total lipid content of liver, testis and ovary in Anabus testudineus exposed to fenvalrate. Anita et.al., 2012 observed that carps when chronically exposed to fenvalerate showed decline in the level of total lipid content in some tissues viz. intestine testis and ovary. This has also been suggested by Jha (1992); Jabde et.al. (1995); and Manjula and Veeariash (2014) that inhibition of lipid synthesis and mobilization of stored lipid as the possible reasons for lipid decline. Mani and Saxena (1985) also hold similar view.

Thus at the present state of our knowledge no single reason can be given and it needs extensive studies in this line.

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