Lipid changes in the freshwater fish *Ophiocephalus punctatus* exposed to synthetic pyrethroid cypermethrin

Shruti S. Gijare, I.A. Raja,* V.T Tantarpale and K.M. Kulkarni**

P G. Department of Zoology, Vidyabharati Mahavidyalaya, Camp, Amravati.

*Shri Shivaji Science College, Akola.

**Ex- Director of Higher Education, Govt of MS Pune.

ABSTRACT:-

Pollution leads to widespread denaturation of the environment, threatening the very existence of living beings. Excessive use of pesticides globally has become a major concern and contributes to severe chemical pollution. Alteration in the chemical composition of natural aquatic environment by such pesticides induces behavioral and biochemical changes in the aquatic inhabitants particularly fish. Protein, carbohydrates and lipids constitute major component of the fish body. Pesticides like synthetic pyrethroid- cypermethrin have caused notable effects on the lipid content of liver and intestine of fresh water fish *Ophiocephalus punctatus*, which were treated with sublethal concentrations of cypermethrin at different time intervals. The study showed that there was a decline in the lipid levels of the liver and intestine of the exposed fishes.

Key words: Cypermethrin, lipids, *Ophiocephalus punctatus*, liver and intestine.

INTRODUCTION:-

Fish- pollutant relationship has considerable importance in the study of fish population and energy patterns in fish stocks of particular area. Lipids play very important role in the architectural dynamics of the cell and transport mechanism across cell membrane. Any stress is found to change the course of events associated with the lipid synthesis. Lipids also contribute to energy production as they are having high calorific values, (Guyton, 2006;) and play a vital role during the biochemical adaptations of animals to stress conditions (Tayyabhe *et al.*, 1981; Swami *et al.*, 1994). Extensive literature is available on the effects of different pesticides on tissue lipid fraction of various animals, (Srinivas *et al.*, 1991, Chetty and Indira, 1994, Govindan *et al.*, 1994, Martin *et al.*, 2007).

Cypermethrin is a synthetic pyrethroid (insecticide) used for the control of insect pests. Pesticides affects the survival and growth rate of fish. The protein, carbohydrate and lipid contents decreased significantly in muscle, liver and intestine of *Cyprinus carpio* when exposed to sub lethal concentration of textile mill effluent pesticide due to their potential toxicity produce biochemical changes in the tissues and organs of exposed animals, (Sastry and Sharma 1979). The biochemical function of animal gets disturbed on exposure to pollution stress. A better understanding of this mechanism can help us to predict the harmful effect of various chemicals on environment. A particular pollutant incites a specific type of biochemical change. The aquatic organisms are susceptible to pollution effect of pesticide, heavy metal as well as industrial effluent. But normally an organism tries to adapt itself to these change by changing their metabolic activities, but at higher concentration these pollutant can cause damage to biochemical system by affecting the organism either organ, cellular level even at molecular level in turn causing changes in biochemical composition. In the present study an attempt is made to know the effect of cypermethrin on the lipid content of liver and intestine of freshwater fish *Ophiocephalus punctatus*.

MATERIALS AND METHODS :-

The fish were obtained from Wadali lake in Amravati region. The fish having 12 – 30 cm Length 15 – 25 gm. weight were selected for experiment. After the normal process of acclimatization and washing a group of six fishes were transferred to another aquarium containing sub lethal concentration 0.0007 µ / Lit. of cypermethrin for predetermined exposure at 24,48,72 and 96 hrs. The fishes were sacrificed and fresh tissue was isolated.

RESULTS AND DISCUSSION :-

The sublethal concentration of cypermethrin treated with *Ophiocephalus punctatus* at different time intervals. In the treated liver and intestine lipid content showed a declined trend. The lipid level after exposure to cypermethrin declined in liver that is 18.85, 16.67, 15.32, 12.66 as compared to control value 19.30 mg/l.

In intestine, it also declined in values being 8.89, 7.88, 7.42, 6.96 as compared to control value 9.30 mg/l. The results are summarized in table 1 and figure 1.
Table 1. Effect of cypermethrin on lipids of the liver and intestine of fresh water fish *Ophiocephalus punctatus* at different time intervals, all values in mg/l.

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Control</th>
<th>24 hrs</th>
<th>48 hrs</th>
<th>72 hrs</th>
<th>96 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>19.30 + 2</td>
<td>18.85 + 1.58</td>
<td>16.67 + 1.68</td>
<td>15.32 + 1.78</td>
<td>12.66 + 1.79</td>
</tr>
<tr>
<td>Intestine</td>
<td>9.30 + 3</td>
<td>8.89 + 1.58</td>
<td>7.88 + 1.78</td>
<td>7.42 + 1.68</td>
<td>6.96 + 1.48</td>
</tr>
</tbody>
</table>

Figure 1. Effect of cypermethrin on lipid of the fresh water fish *Ophiocephalus punctatus* at different time intervals (mg/lit).

The decreased value of lipid indicated that there were major changes like accumulation of lipid contents and alteration in the lipid metabolism due to pesticidal stress. In the present investigation it is noted that pesticides showed hazardous effect on the fresh water fish *Ophiocephalus punctatus*.

Pyrethroids are nothing but pesticides which are harmful to living beings. Pyrethroids produce toxic effect on the biochemical and haematological parameters of various terrestrial and aquatic animals (Saxena and Seth, 2002; Saxena and Gupta, 2003).

A decrease in the total lipid content of the liver and intestine exposed to cypermethrin suggests that lipid might have been channeled for energy production for other metabolic function in which these products play a vital role during stress condition. Since lipids form the rich energy reserves whose calorific value was reported to be twice than that of an equivalent weight of carbohydrates or proteins.

Lipids serve as energy reserves to meet the metabolic demand for more energy to mitigate toxic stress.

Srinivas et al., (1991) reported decreased lipid content in *Tilapia mossambica* exposed to atrazine.

In the present investigation there is alteration in lipid content of fish *Ophiocephalus punctatus*. The same results have been observed by Amudha et al., (2002) in the fresh water teleost fish *Oreochromis mossambicus*. Maruti and Rao (2001) reported a decline in the lipid content of the liver and muscle tissues of *Channa punctatus* exposed to sub lethal concentration of sugar mill effluent.

Under sublethal exposure of *Ophiocephalus punctatus* to cypermethrin an over all decreased in total lipid levels in the liver and intestine was observed in present study. Leela et al., (2002) observed that total lipid content of liver, muscle, and gill of *Tilapia mossambica* was decreased under the stress of phosalone. Shivaparvathi et al., (2002) also reported the effect of phosalone on total lipid and triglycerides in freshwater fish *Tilapia mossambica*. Similarly, Swapna et al., (2006) have also also reported the effect of textile bleaching effluent on the biochemical composition of *Cyprinus carpio*, and have described the effects to be
hazardous. Revathi et al., (2005) also observed the decrease level of lipid in fish Gambusia affinis when exposed to tannery effluent. The data of the present study clearly indicate that the toxic nature of the cypermethrin affects the lipid content of liver and intestine of fish, Ophicephalus puntatus. Depletion of lipid content may be due to lypolysis or the mitochondrial injury which impaired the function of TCA cycle and the fatty acid oxidation mechanism.

REFERENCES:--


