

Lipid and Amino Acid Modulation in Fresh Water Fish *Ophiocephalus orientalis* Exposed to Cypermethrin

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Abstract- Cypermethrin, a synthetic pyrethroid showed non-target effects on the freshwater fish *Ophiocephalus orientalis*. The presents study showed the impact of sub lethal concentration (0.0007 μ /lit) of cypermethrin on the concentration of amino acid in two tissues such as liver and muscle of freshwater fish *Ophiocephalus orientalis* at different time intervals. There was observed decrease in lipid level and increase in amino acid level in both tissues muscle and liver of *Ophiocephalus orientalis* at different time intervals.

Key Words: Cypermethrin, Liver, Muscle, Lipid, Amino Acids.

INTRODUCTION:

Water is main component of the environment which is a dynamic entity. It is an effective means of transfer and transport of the waste and other materials. Soil on the other hand is a stationary entity which is indirectly affected by the contaminated water. Toxic waste dumped on soil may cause harm to the animals and indirectly to human beings as well. The structure and function of lotic ecosystems changed due to pollutants.¹ The toxic effect of contaminated water on non target organisms is observed by^{2,3}. One among the environmental problems is the lack of proper management of domestic and industrial wastes which release hazardous chemicals. There is no doubt that these excessive levels of pollutants are causing a lot of damage observed in human and animal health. The organic pollutants may cause declines, deformity and death of autistic life, which in turn may cause disease to humans⁴⁻⁶. The aquatic environment is very important because it is a store house of variety of fishery resources. Presently, aquatic pollution is considered as a serious problem of the world. It has been estimated that about 70,000 manmade chemicals are used daily by humans. These chemicals have contributed a lot to the green revolution but their deleterious effects on various ecosystems cannot be ignored⁷. Changes induced in the total protein, glycogen and lipid content of some selected tissues of the freshwater fish, *Channa punctatus* exposed to technical endosulfan and its isomers were studied. Technical endosulfan decreased Glycogen and lipid concentration of liver glycogen of muscle increased the protein and glycogen of kidney and protein content of brain.⁸ The pesticide abate in the liver of catfish *Heteropneustes fossilis* showed fluctuation in glucose glycogen protein and cholesterol levels.

MATERIALS AND METHODS:

The freshwater fish *Ophiocephalus orientalis* were collected from Wadali lake around Amravati region, India. The fishes were acclimatized at laboratory condition for 1 week. The LC₅₀ value was calculated by probity analysis method⁹. The LC₅₀ value is 0.0007 μ /lit at 72 h. The acclimatized fishes were exposed to sub lethal concentration for 24 h, 48 h, 72 h and 96 h; simultaneously a control group of healthy fishes were maintained under identical conditions. The fishes were sacrificed at the end of exposure period and liver and muscle were processed for the biochemical estimation. Amino acid was estimated by the method of Moor and Stein¹⁰. Lipids were estimated according to the method of Floch¹¹.

RESULT:

Liver :

The sublethal concentrarion of cypermethrin treated with *Ophiocephalus orientalis* at different time interval and observed that in the liver and muscle lipid showed declined trend. The lipid level after exposure to cypermethrin was declined in liver that is, 19.85 \pm 1.58, 18.67 \pm 1.68, 16.32 \pm 1.78, 15.66 \pm 1.79 as compared to control value 20.30 \pm 2.00 .

Muscle :

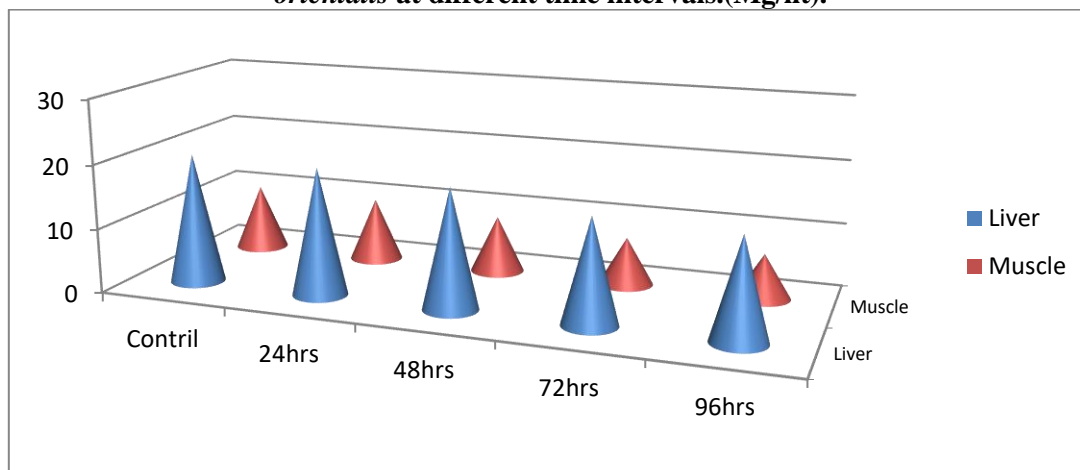
The sublethal concentrarion of cypermethrin treated with *Ophiocephalus orientalis* at different time interval and observed that in the liver and muscle lipid showed declined trend. The lipid level after exposure to cypermethrin

was declined in muscle that is, 9.89 ± 1.58 , 8.88 ± 1.78 , 7.45 ± 1.68 , 6.96 ± 1.48 as compared to control value 10.30 ± 3.00

Table: 1: Effect of cypermethrin on Lipid of the freshwater fish *Ophiocephalus orientalis* at different time intervals.(Mg/lit).

| Tissue | Control | 24hrs | 48hrs | 72hrs | 96hrs |
|--------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Liver | 20.30 ± 2.00 | 19.85 ± 1.58 | 18.67 ± 1.68 | 16.32 ± 1.78 | 15.66 ± 1.79 |
| Muscle | 10.30 ± 3.00 | 9.89 ± 1.58 | 8.88 ± 1.78 | 7.45 ± 1.68 | 6.96 ± 1.48 |

Fig.No.:1 Effect of sublethal concentration of cypermethrin on Lipid of the freshwater fish *Ophiocephalus orientalis* at different time intervals.(Mg/lit).



In the present study lipids in liver and muscles of fish *Ophiocephalus orientalis* were decreased due to exposure to cypermethrin. It can be correlated with the change in the lipid digesting enzyme like lipase. Since lipids constitute very rich energy reserve, its decrease indicates the changes in energy demand of fish during exposure to cypermethrin.

Amino Acid :

Liver :

The amino acid contents in the liver of the freshwater fish *Ophiocephalus orientalis* exposed to sublethal concentration of cypermethrin at different time intervals and it showed increased trend 15.49 ± 0.88 , 16.28 ± 0.95 , 17.29 ± 0.93 , 18.30 ± 0.98 as compared to control value 14.55 ± 0.19 , 14.59 ± 0.24 , 14.63 ± 0.26 , 14.70 ± 0.19 .

Muscle:

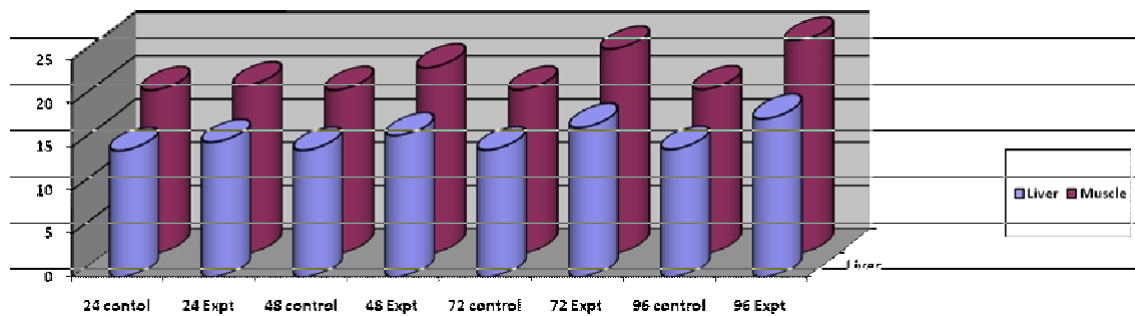
The sublethal concentration of cypermethrin treated to freshwater fish *Ophiocephalus orientalis* showed increased trend of amino acid in muscle 19.30 ± 0.99 , 21.36 ± 1.08 , 23.50 ± 1.2 , 24.52 ± 0.85 as compared to control value 18.75 ± 0.21 , 18.77 ± 0.18 , 18.80 ± 0.20 , 18.85 ± 0.18 .

In present study the cholesterol content showed decreased level of the freshwater fish *Ophiocephalus orientalis* treated with sublethal concentration of cypermethrin exposed to different time intervals. Amino acids while acting as precursor for protein synthesis are involved in gluconeogenesis, synthesis of glycogen and keto acids. In the present investigation the amino acids level were found to increase in tissues. This increase in amino acids levels suggests that tissues damage probably due to the increase in proteolytic activity under toxic stress and also by protein hydrolysis.

Table 2 : Changed in the Liver and muscle amino acid of the freshwater fish *Ophiocephalus orientalis* exposed to sublethal concentration of cypermethrin at different time interval.(Mg/lit)

| Exposure period | Liver | | Muscle | |
|-----------------|---------------------|---------------------|---------------------|---------------------|
| | Control | Expt. | Control | Expt. |
| 24 | 14.55 ± 0.19 | 15.49 ± 0.88 | 18.75 ± 0.21 | 19.30 ± 0.99 |
| 48 | 14.59 ± 0.24 | 16.28 ± 0.95 | 18.77 ± 0.18 | 21.36 ± 1.08 |
| 72 | 14.63 ± 0.26 | 17.29 ± 0.93 | 18.80 ± 0.20 | 23.50 ± 1.2 |
| 96 | 14.70 ± 0.19 | 18.30 ± 0.98 | 18.85 ± 0.18 | 24.52 ± 0.85 |

Fig. No.2 : Changed in the Liver and muscle amino acid of the freshwater fish *Ophiocephalus orientalis* exposed to sublethal concentration of cypermethrin at different time interval



DISCUSSION

In the present investigation, cypermethrin exposed to freshwater fish *Ophiocephalus orientalis*. Decrease in lipid content in tissues at different time intervals suggest that the lipid might have been channelized to meet the metabolic demand for extra energy needed to mitigate the toxic stress. Similar finding was that the effect of malathion and cypermethrin on lipid constituents of freshwater fish *Lepidocephalicchthys guntea*.¹² They observed that, the level of lipid content decreased significantly in all treated groups, when compared with control.

Lipid plays an important role in energy metabolism and provides energy to metabolic processes. They are also important for cellular and sub-cellular membrane. It is used as energy reservoir, stored and transported in the form of glycerol ester.¹³ Lipid level decreases significantly because liver is the principle site of detoxification in fishes.¹⁴ The decrease in lipid levels in the liver tissues of *Cirrhina mrigala* exposed to fenthion were observed.¹⁵

The depletion of lipid content in liver tissue of *Sciaenops ocellatus* and *Fundulus heteroclitus* exposed to synthetic pyrethroid permethrin was investigated.¹⁶ Similar study was also conducted on toxic effect of deltamethrin on lipid content in liver and intestine of *Carassius auratusgibelio*. The decrease in the lipid content is because of lipid peroxidation.¹⁷

In the present study the increase in the amino acids level was observed under the toxic effect of a synthetic pyrethroid, cypermethrin exposed to freshwater fish *Ophiocephalus orientalis*. Amino acids are considered as one of the most reliable techniques for the detection of changes in protein synthesis in cell and therefore, the protein pattern can be used as a criterion for the differentiation between several organs exposed to some pollutants.

The similar study was also given by¹⁰, on the freshwater fish *Cirrhinus mrigala*. The toxic effect of cypermethrin also showed increased trend in *Cirrhinus mrigala*¹⁸, observed that there was increase in the amino acids level in the tissues of *Labeo rohita* and *Cirrhinus mrigala* exposed to fenvelerate. Similar increase of amino acids in *Labeo rohita* exposed to endosulfan was observed by¹⁹.

The freshwater fish *Clarias batrachus* exposed to cypermethrin, showed increased level of amino acids in muscle and kidney of fish^{20,21}, observed that piscicidal activities of aqueous extract of *Euphorbia tirucalli* on freshwater fish *Chanaa punctatus* altered the level of amino acids.²²

Similar study was also given by^{23,24}, observed that the increase in amino acids level in liver of *Channa marulius* when exposed to dimethoate and monocil.

Concluded that protein decreased because of more utilization due to pesticidal stress also which breakdown protein released amino acids in the tissue which was used in prolonged period.

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