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CHRONIC EFFECTS OF ORGANOPHOSPHORUS INSECTICIDE 'FENTHION' IN MELANOPHORE PIGMENTS OF *Cyprinus carpio (Linn)*

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Abstract

Fish skin, directly exposed to the ambient toxicants; is used extensively as a potential indicator of contaminated aquatic environment. Chronic effect of fenthion on melanophore of Cyprinus carpio was investigated to understand its toxicity on melanophore morphology. Observed toxicological alterations include significant variations in size, shape and in number of melanophores. Fenthion- induced morphological changes in melanophore seemed to be an attempt to protect the epidermis from toxic medium. The density of melanophore was found to a maximum after 60 days. Destructive changes that resulted could be due to accumulation of fenthion in nervous tissues. Due to the lysis of the melanophores, the melanin contents are poured into the surrounding matrix of the connective tissue between 20 and 30 days of exposure. The regenerated pigment cells were smaller in size and more in number as compared to the normal melanophores. Present study also showed the melanizing effect of fenthion toxicity.

Keywords: Organophosphorous, *Fenthion*, Melanophore, *Cyprinus carpio*, Toxicity

INTRODUCTION

The body covering of multi- cellular animals is usually pigmented and it is a matter of general observation as well as careful experimentation that such coloration is frequently cryptic and often provides help in indicating the extent of pollution in the environment [3]. The pollutants like insecticides are widely used in agriculture and are drained into the nearby rivers or ponds which are the natural habitat of fishes. Hence, it is important to study the insecticide effect on melanophore cells to evaluate the extent of stress.

Very few records are available on melanophore studies. Work has been carried out on fish scale melanophore which showed that there is isolation of peripheral cytoplasm during the melanin dispersion [6]. Melanophore was cultured and found that melanophore contracts in sodium- free potassium medium and this even occurred in presence of MSH [7]. The effect of drug and chemicals on aggreviation or dispersion of pigment due to effect of DDT on MSH was also studied in anuran tadpole [2]. The effect of organophosphorus insecticide on melanophore of cichlid fish *Serotherodon mossambica* was also observed [7].

The present study deals with the effect of insecticide *fenthion* on melanophore cells of *Cyprinus carpio* to determine the extent of pesticide stress on melanophore pigment.

MATERIALS AND METHODS

The animals were weighed and acclimatized under laboratory conditions [1]. At the end of acclimatization, the fishes were exposed to three different sub- lethal concentrations of *fenthion* (0.38, 0.193, 0.096 mg/ l) respectively. To determine the changes in the state of melanophore, scales were

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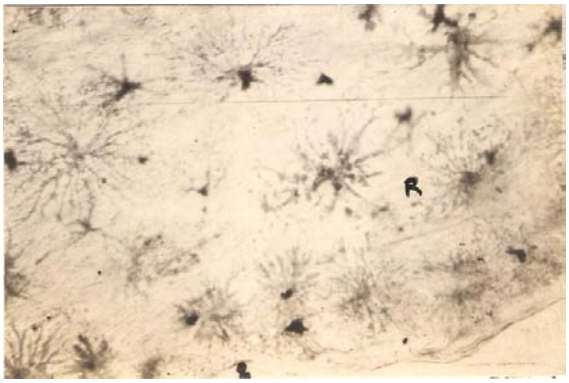
removed from the tail region of the control and treated fish bodies at the end of the 60 days exposure period and were compared with the control for further studies.

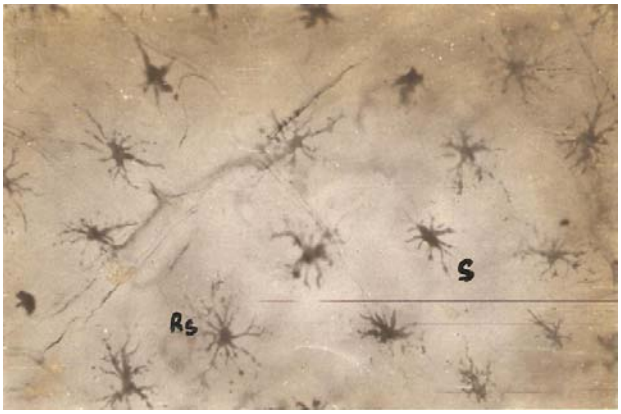
RESULTS AND DISCUSSION

The examination of melanophore pigment exposed to three different sub- lethal concentrations of *fenthion* revealed that scales exposed to low sub- lethal concentration of *fenthion* (0.096 mg/ l) showed a much notable difference in melanophore cells whereas severe damage to melanophore cells was observed in fishes exposed to 0.38 and 0.193 mg/ l of *fenthion* when compared to the control.

(a) Melanophore cells exposed to 0.096 mg/ l



(b) Melanophore cells exposed to 0.38 mg/ l



(c) Melanophore cells exposed to 0.38 mg/ l

Melanophore control: Fig. a, Fig. b and Fig. c

Typical teleost scale consists of five types of melanophore pigment cells:

1) Punctate melanophore

Very few small sized round structures without any dendritic processes

2) Puntostellate melanophore

Small round structures with 5- 7 unbranched dendritic processes

3) Stellate melanophore

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Single branch at the tip region of every dendritic process

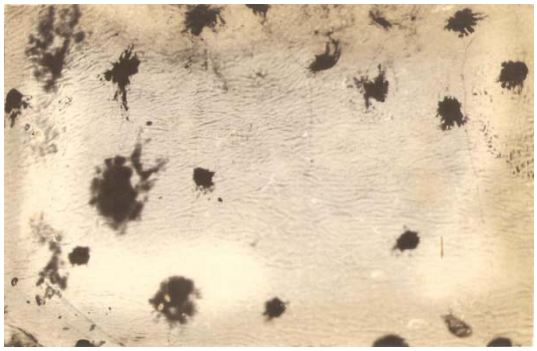
4) Reticulostellate melanophore

Reticulate branching of every dendritic process

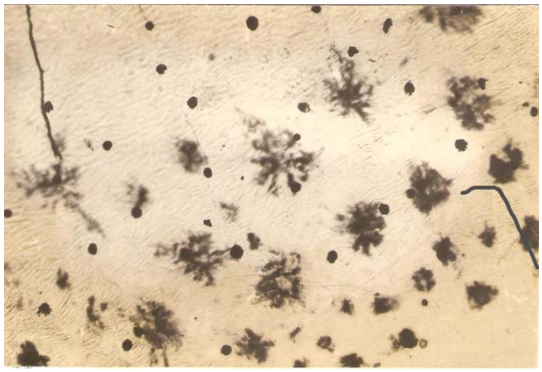
5) Reticulate melanophore

The largest melanophore with numerously branched thick and long dendritic processes

(d) Melanophore cells exposed to 0.096 mg/ l



(e) Melanophore cells exposed to 0.38 mg/ l



(f) Melanophore cells exposed to 0.38 mg/ l

Melanophore chronic: Fig. d, Fig. e and Fig. f

1) **Punctate melanophore:** No particular change in punctate melanophore state was seen. The number of punctate melanophore increased significantly in 0.096, 0.193 & 0.38 mg/ l *fenthion* exposed scales. This was proportional to the concentration of insecticide exposed.

2) **Punctostellate melanophore:** Dendritic processes of punctostellate melanophore exposed to 0.096, 0.193 & 0.38 mg/ l *fenthion* were broken severely and fused with each other. Damage was severe in those exposed to the highest concentration [8].

3) **Stellate melanophore and reticulostellate melanophore:** Dendritic processes were broken and the shape was significantly deformed. In highly dosed fish scales, the dendritic processes were broken completely and fused with each other giving it an irregular appearance [8].

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4) **Reticulate melanophore:** The dendrites were severely damaged in highly exposed fish scales and the shape of the melanophore was significantly deformed.

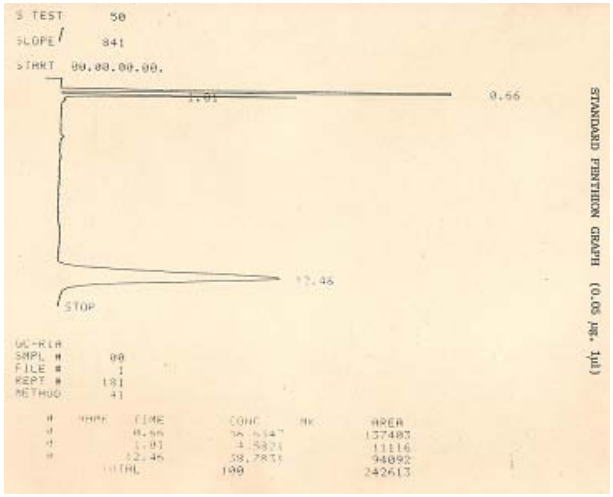
In the scales of *Cyprinus carpio* exposed to 0.38 mg/ l *fenthion* aggregation of broken melanophore cells was observed. The melanin pigment seemed to contract centrally. This could be the reason for darkened appearance of fish.

Melanophore changes are controlled by various factors such as neuro- humors, hormones, neuro-secretion and other nervous control of endocrine function. The ionic mechanism involved in MSH might be producing cytoplasmic solution by changing the permeability of melanophore membrane to ions [4] [5]. Finally, the real possibility that MSH acts on melanophore by an ionic and osmotic mechanism indicates that there is a similarity between melanophores and neurons. In support of this work, destruction observed in melanophore pigment in exposed fish during the present study may be its adaptation to stressful condition and could be due to high accumulation of *fenthion* in nervous system (Brain) as in **Table 1**.

TABLES AND GRAPHS

I. Residue level of fenthion in mg/ l in the aquarium freshwater in which the test fish i.e. *Cyprinus carpio* was kept

Exposure period	Control	Concentrations of *fenthion* in mg/ l		
Initial	Nil	0.096	0.193	0.38
24 hours	Nil	0.02 ± 0.009	0.09 ± 0.004	0.19 ± 0.002
48 hours	Nil	0.08 ± 0.003	0.04 ± 0.02	0.03 ± 0.001



Fenthion residue in brain of *Cyprinus carpio*

CONCLUSION

Destructive changes observed in melanophores of exposed fish are directly related to the strength of dose induced. Extensive damage observed in melanophore could be due to the accumulation of

fenthion in nervous tissues and also maybe due to the changes in ionic regulation. The melanophore changes noted is a significant abnormality providing a symptomatic index of toxicity.

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