

IMPACT OF SUBLETHAL CONCENTRATION OF METHOMYL 40 % SP CARBAMATE INSECTICIDE ON PROTEIN CONTENT IN THE VITAL ORGAN LIVER OF FRESH WATER FISH MYSTUS SEENGHALA (SKYES 1839)

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Abstract : This study has been undertaken to investigate the impact of sub lethal concentration of Methomyl 40 % sp Carbamate insecticide on protein content in the vital organ liver of fresh water fish *Mystus seenghala* (Skyes 1839). During our present investigation fishes were exposed to the sub lethal concentration of 40 % Methomyl a carbamate insecticide for 10, 20 and 30 days respectively. The protein contents in the liver tissues were determined by standard procedures from control fish and the fish exposed to Methomyl. The results showed significant reduction in the protein content of liver on Methomyl exposure. The fluctuations in these are indicative of the organism's response to the toxicant stress.

IndexTerms – Sub lethal, Methomyl, Liver, Protein, Reduction.

I. INTRODUCTION

Pesticides are extensively used to enhance the agriculture production by controlling different kind of pests. However at the same time severe environmental issues arise because of pesticides which influence structure and function of ecosystem [1]. Pesticides enter the aquatic environment through rivers, by direct application, spray, drift, aerial spraying, and washing, from the atmosphere by precipitation, erosion and runoff from agricultural land, industrial plant effluents and sewage [2]. Fishes are in direct contact with the surrounding water through their gills. Proteins are macromolecules considered as the architecture of cell. Proteins are involved in physical and chemical activities to maintain the homeostasis of the cell [3]. Pesticides have an effect on non-target animals like fish. Pesticides are extremely harmful, not only to fishes but also to different organisms. The intake of pesticides affects the biochemical composition of fishes [4].

Mystus seenghala (Skyes 1839) is found in large rivers, reservoirs, canals, flooded fields and ponds. The vernacular name of *Mystus seenghala* is "Shingta" in Maharashtra; *Mystus* is a predatory fish, feeds on other fishes. It is considered to a graceful swimmer for its size. It is one of the largest edible fish. It is considered to be a very important food fish & fetches a good price in the market. [5].

In the present study, an attempt has been made to investigate the impact of carbamate insecticide (Methomyl 40% SP) on total protein content in the liver tissues of the fresh water fish *Mystus seenghala* (Skyes 1839).

II. RESEARCH METHODOLOGY

2.1 Experimental Test Fish *Mystus seenghala*

For the present study, the live fresh water fish *Mystus seenghala* (Skyes 1839) (12±5cm) were collected from river Bhīma of Pune district (M.S.) India, and brought to the laboratory. Care was taken to reduce hyperactivity and physical injuries to the fish. They were screened for any possible pathological symptoms and washed with 0.1% KMnO₄ solution. They were then stocked and maintained in large Aquarium tank containing chlorine free water for 10 days under normal temperature. Before stocking, the tank was washed with 1 percentage KMnO₄ to avoid the fungal infection. Water was changed in alternate days. The fishes were fed a commercial fish diet.

2.2 Experimental Set Up

Well acclimatized fresh water test fish *Mystus seenghala* (Skyes 1839) approximately length (12±5cm) were selected from the stock and exposed to sub lethal concentration of 40 % Methomyl SP for 10, 20, 30 days respectively to investigate impact of sub lethal concentration of Methomyl on protein content in the liver. In the present study 1/10th of 96hr LC₅₀ concentration were selected as sub lethal concentration. The experiments were carried out in glass aquarium with 10 fishes each. The experimental medium was renewed daily till the end of the experiment. The experiment was repeated five times and the mean values recorded separately for test fish. Simultaneously ten fishes were reared in pesticide-free medium and are treated as control for pesticide experiment.

2.3 Estimation of Protein

Total protein content in the tissues was estimated by using the method of Lowry et.al [6]. Known weight of fish (both test and control) the Liver tissue were dissected and homogenized in 10 % TCA (Trichloroacetic acid). The homogenate was centrifuged at 3000 rpm for 10 minutes, a supernatant was decanted and the residue was suspended in 1.0 ml of 0.1 NaOH solutions and transferred into a clean test tube. 5 ml of alkaline copper carbonate reagent solution was added and allowed to react for 10 minutes. Thoroughly mixed contents were kept at room temperature for 30 minutes; the optical density was measured at 540 μ m against the reagent blank 0.4ml folins phenol reagent. The total protein content expressed as in mg/ 100mg wet weight of tissue.

Calculation

$$\text{Total Protein Concentration} = \frac{\text{Absorbance of sample} \times \text{Standard concentration}}{\text{Absorbance of standard}}$$

III. RESULTS AND DISCUSSION

The sub lethal concentration of Methomyl 40 % SP treated with *Mystus seenghala* at different exposure period interval and observed that in the liver protein level showed declined trend. The changes in the level of protein contents in liver of the fish, *Mystus seenghala*, were given in the Table No. 1 and Figure No. 1.

Table No-1. Effect of Sub lethal concentration of Methomyl (0.42 ppm) (1/10th of 96hr LC₅₀ value) on Protein content (mg/100mg) in liver tissues of *Mystus seenghala* after chronic exposure.

Organ	Control	Exposure Period		
		10 Days (0.42 ppm)	20 Days (0.42 ppm)	30 Days (0.42 ppm)
Liver	19.26 \pm 0.16	16.22 \pm 0.12 (15.84)	14.58 \pm 0.14 (24.29)	12.26 \pm 0.28 (36.34)

mg /100mg wet wt. of tissue.

Each value indicates the mean (X \pm SD) of five estimations.

Figures in bracket indicate difference in percentage over control.

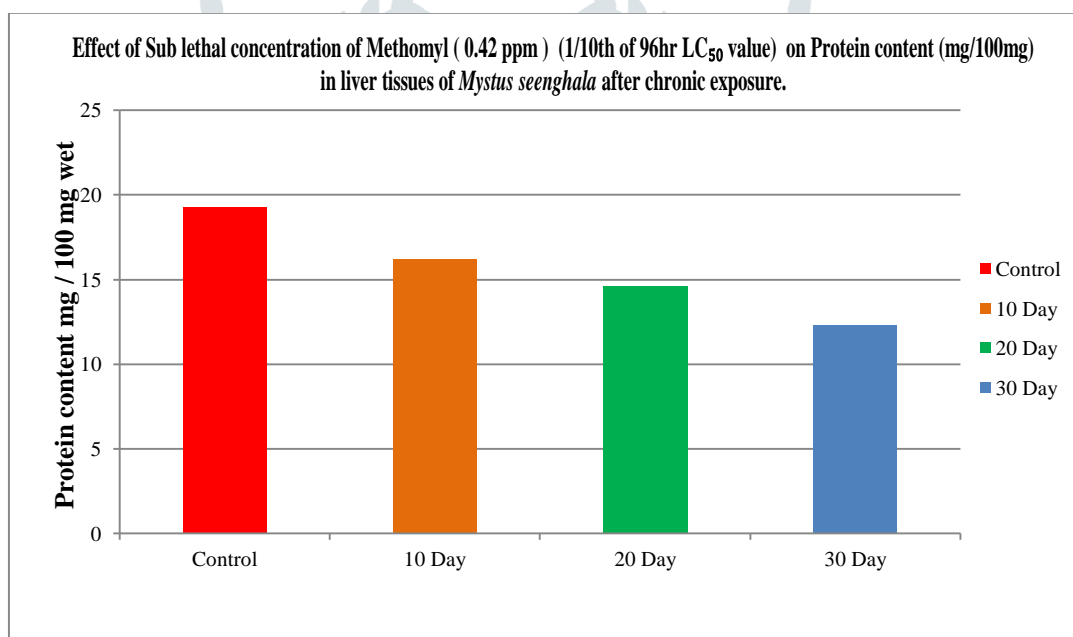


Figure No-1. Effect of Sub lethal concentration of Methomyl (0.42 ppm) on Protein content (mg/100mg) in liver tissues of *Mystus seenghala* after chronic exposure

Protein content in liver showed a reduced trend to 16.22 \pm 0.12 mg/100mg wet tissue on 10th day. It was found to have been further decreased to 12.26 \pm 0.28 mg/100mg wet tissue after 30 days of exposure period at the 0.42ppm sub lethal concentration of Methomyl 40 % SP, which was equivalent to 36.34 % reduced from the control value (19.26 \pm 0.16 mg/100mg wet tissue).

In the test fish, the liver protein contents recorded were 16.22 \pm 0.12 , 14.58 \pm 0.14 and 12.26 \pm 0.28 mg/100mg wet tissue at .42 ppm sub lethal concentration of Methomyl 40 % SP for 10, 20 and 30 days of exposure respectively. The percentage of reduction in liver protein over the control was 15.84%, 24.29% and 36.34 % after 10, 20 and 30 days of exposure respectively.

Protein is a very important constituent of animal tissue that plays a vital role in cellular metabolism and regulates the process of interactions between intra and extra cellular media as constituent of plasma membrane. However the protein metabolism has been reported to change due to the stress of varied contaminants. This depletion of tissue protein might reflect a previous increased energy cost of homeostasis, tissue repair and detoxification throughout stress [7]. Considerable reduction in protein contents of liver tissues of *Mystus seenghala* was recorded when the exposure of fish to Sub lethal concentration of Methomyl 40 % SP for 10, 20 and 30 days. This results also coincides with the findings of [8] have determined protein depletion in liver and muscle tissues in the *Channa punctatus* under the stress of Oleandrin . The same reduced liver protein level has also been found in *Mystus vittatus* exposed to nuwan [9]

The present work indicates that insecticides caused alterations within the protein metabolism of fish treated tissues. The altered mobility and low content of proteins reflects a modification within the rate of synthesis and degradation of protein. Proteins are primarily concerned in the architecture of the cell. During stress conditions they are a source of energy as fish want a lot of energy to detoxify the toxicant and to beat stress. The depletion of total tissue protein is also because of the impact of pesticides on the physiological adaptability of the fish to compensate for pesticide stress, raised proteolytic activity, reduced protein synthesis and utilization of their product for metabolic functions and cause injury to tissues [10, 11].

IV. CONCLUSION

In the present studies, the decrease in protein level in the liver tissue observed in test fish *Mystus seenghala* treated with Methomyl can be due to reduced protein synthesis and utilization of their product for metabolic functions and cause injury to tissues as per the view expressed by other researchers.

V. ACKNOWLEDGMENT

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