EFFECT OF DIMETHOATE ON BIOCHEMICAL PROFILE OF LIVER AND MUSCLE IN FRESH WATER FISH, *GARRA MULLYA* (SYKES) FROM SHIVEN RIVER, NANDURBAR

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Abstract: ***Alteration in physiological functions and of body structures are the most important detectable parameters of pollution effects at individual as well as population level. Changes in biochemical composition of liver and muscle tissue of fresh water fish, Garra mullya (Sykes) exposed to concentration of dimethoate (0.0238ppm of 96hrs.) along with control animals were studied for 7, 15, 21, 30 days. The total protein content decreased in acute and chronic treatment of dimethoate. Chronic exposures to low levels of pesticides have more significant effect on fish pollution than acute poisoning.***

Key Words: ***Biochemical Profile, Dimethoat, Garra mullya, Liver, Muscle.***

INTRODUCTION

The water pollution is thus no longer considered to be an aesthetic problem, but a serious economic and public health problem as well. Unfortunately, raw or inadequately treated sewage of millions of people still flow into our lakes and rivers, creating several kinds of disorders. The release of discharge of large number of pollutants, especially heavy metals and pesticides, pose a threat to human life (Saikia, 1988). Pollution of aquatic environment by pesticides is an extremely important and serious problem and has attracted the attention of the scientists all over the world. Pesticides are occasionally used indiscriminately in large amounts causing environmental pollution and potential health hazards. Dimethoate is systemic insecticides produced by reacting salts of Dimethyldithio-phosphoric acid with N-methylchloroaecetamide, in aqueous medium in the presence of some organic solvents is widely used against a broad range of insects and mites and is also used for indoor control of houseflies. The extensive use of DM poses a health hazard to animals and humans because of its persistence in soil and crops (WHO/IPCS, 1996). Fishes are accumulating pollutants directly from contaminated water and indirectly via food chain (Sasaki, et al., 1997). The runoff from treated areas enters the river and aquaculture ponds that are supplied by rivers and adversely affect the quality of water surfaces and creates hazards for aquatic life resulting in serious damage to non-target species, including fishes (Bondarenko, et al., 2004).

Fishes are rich in high quality, balanced and easily digestible protein, vitamins and polyunsaturated fatty acids. Ravichandran *et al*, (2010) reported fishes as good source of immense antimicrobial peptide that defends against dreadful human pathogens. Quality of the flesh of fish for human consumption depends on its biochemical composition (Hernandez *et al*, 2001), physiological condition and habitat of fish (Ravichandran *et. al*, 2011). Proteins play an important role in energy production. Normally, under stressed condition tissue proteins in aquatic animals activates compensatory mechanism (Wigglesworth, 1972). Protein metabolism is considered the most sensitive physiological response to environmental stress. Biochemical alteration in the animal tissue exposed to varying amount of toxicants is the first indication of the stress in the organism (Venkataramana *et.al* 2006). The biochemical studies helps to find out the effects of pollutants on different metabolism of fish (Kajare *et. al*, 2000). The present study investigated dimethoate induced variation in protein in the tissues of fresh water fish *G. mullya* (Sykes) after acute and chronic exposure.

The present study was under taken to analyze the impact of chronic concentration of dimethoate in liver of fish, *Garra mullya*.

MATERIALS AND METHODS

Medium sized fresh water cyprinid fishes, *Garra mullya* were collected from Shiven river area Nandurbar Dist. Nandurbar in the month of December, 2017. The physico-chemical parameters of the water used by the methods APHA and AWWA (2005). Fishes were washed with 0.1% of potassium per magnate (KMnO4) solution to avoid dermal infection. They were then rinsed in water and acclimatized to the laboratory conditions in the department of Zoology for two weeks in 200 liter capacity glass aquaria. Dead fish were removed immediately that such mortality may deplete dissolved oxygen with resultant effect on other fishes. During acclimatization fishes were fed with pieces of live earthworm on alternate days. Water also changed once in every day. The experiment was conducted natural and photoperiod of temperature 25·1 ± 3·20C, Conductivity- 0.64 ± 0.3, Dissolved O2- 6.3±1.1 (ml/L), pH- 8.60 ± 0.3, Acidity- 2.5± 0.1, Alkalinity- 44.1 ± 0.5, Total hardness- 67.5 ± 0.3. LC50 of Dimethoate for (0.0238ppm of 96hrs) was determined. The amount of total protein was estimated by using Lowry's method (Lowry *et.al*, 1951) by probit analysis method (Finney, 1971). At the end of exposure period liver and muscle tissues of sacrificed fishes were isolated at the interval of for 7, 15, 21, 30 days for sublethal treatment and used to investigate dimethoate induced changes in biochemical profile.

RESULTS AND DISCUSSION

Proteins are importance organic substances require in tissue building and repair, under stress condition protein supplies energy in metabolic pathway and biochemical reaction. Decreased protein level in experimental tissues as compare to control may be due to stress induced by heavy metal. Depletion of protein content at chronic exposure of pesticide to freshwater fish, *Garra mullya* suggest the possible utilization of protein for

various metabolic purpose of enhanced property proteolysis to meet under pollution stress condition. The physico-chemical properties given, while the protein contents in different tissues after exposure to dimethoate are given in the Table1. After chronic exposures to dimethoate, protein contents in the different tissues of *Garra mullya* were found to be depleted. Changes in the total protein Contents (mg/gr. wet weight of the tissue) and percent change over the control in different tissues of the fresh water fish, *Garra mullya*. The changes in the protein contents of a tissue due to heavy metal stress indicate the changes in the activity of the organism. It reflects in the utilization of their biochemical energy to counteract the toxic stress. The decrease in protein content was more due to break down rather than retarded synthesis which is supported by the findings of Radhaiah (1988). Exposure of fish to toxic stress will stimulate protein metabolism (Kabeer et al, 1981).

Proteins are mainly involved in the architecture of the cell which is chief source of nitrogenous metabolism and during toxicant stress they are also source of energy Mommesen et *al*., (1992). It serves as a source of energy for fish and it will be used when insufficient energy is available from other sources like carbohydrate. It regulates the process of interaction between intra and extra cellular media.

Decline in protein may be due to enhanced protein catabolism, lead causes depletion of protein bound sulfhydryls with an increased oxidative stress to cell, Singh *et al*., (2005). The depletion in tissue proteins of *Labio rohita* may be due to impairment or low rate of protein synthesis under metal ion stress by Nanda and Behera, (1996). Bais and Lokhande, (2012), studied the cadmium chloridetoxicity in freshwater fish, *Ophiocephalus stiatus* and reported reduction in protein level in various tissue. Gopala Rao *et al*.,(2006), reported that protein serve as energy source during stress condition also showed decreasing trend in the tested organ, maximum depletion was observed in liver, muscle and gill followed by kidney and brain depletion was equal in liver and muscle. Waghmare and Wani, (2016), reported an insecticide confider induce changes in the normal level of protein in tissues of freshwater fish, *Channa gaucha*. It affect the natural food value of fish. Toxic substances present in the immediate surroundings of the organisms changes the physiology of organism and affect the protein level. Organisms need sufficient energy to reduce toxic effect of pollutant which is supplied from protein. The decrease in the protein content seems to be due to utilization of protein for metabolic activities and also due to increased breakdown of protein to meet high energy demands when fishes are exposed to pesticidal stress conditions.

Table 1: Fluctuation in Protein Content in *Garra mullya* chronically exposed at three different Sub-lethal concentration of Dimethoate (concentration in ppm)

Period in days	Tissue	Control	0.00479	% change	0.0002385	% change	0.000157	% change
1	2	3	4	5	6	7	8	9
7 days	Liver	13.1999 ± 0.2394	12.3199 ± 0.2396	-6.68	11.7333$^{###}$ ± 0.2395	+11.12	12.1243 ± 0.7315	+8.15
	Muscle	14.1778 ± 0.1388	13.6886$^{##}$ ± 0.2769	-3.44	13.3954$^{##}$ ± 0.1384	-5.5	13.1998$^{##}$ ± 0.2396	- 6.87
15 days	Liver	13.1997 ± 0.2395	12.2223 ± 0.3659	-7.5 -1.38	12.1244$^{##}$ ± 0.1384	-8.3	13.4933 ± 0.2396	+2.3
	Muscle	13.9820 ± 0.1383	13.7866 ± 0.2397	-1.38	13.1028$^{#}$ ± 0.3659	-6.30	13.0044$^{#}$ ± 0.3658	- 6.98
21 days	Liver	12.6133 ± 0.4790	12.2223 ± 0.3659	-3.2 -3.6	12.0265 ± 2397	-4.6	12.7109 ± 0.3659	+0.77
	Muscle	13.8844 ± 0.1383	13.3954$^{##}$ ± 0.2767	-3.6	13.0043$^{#}$ ± 0.3659	-6.4	12.9066$^{##}$ ± 0.2396	-7.1
30 days	Liver	13.9556 ± 0.5466	12.3198 ± 0.2395	-4.9	12.1243 ± 0.1384	-6.5	12.9065 ± 0.2395	-0.39
	Muscle	13.4933 ± 0.2395	12.6133 ± 0.7185	-6.5	13.1022 ± 0.3658	-2.9	12.7108$^{##}$ ± 0.1383	-5.79

The Values are expressed in mg. /100mg. wet weight (mean ± S.D.)
$^{#}$ = P<0.05, $^{##}$ = P<0.01, $^{###}$ = P < 0.001

CONCLUSION

It is concluded that lethal and sub-lethal exposure of *G. mullya* to systemic insecticides, dimethoate promoted massive utilization of protein from liver and muscles in order to meet the increased energy requirement of enhanced metabolic activity. Chronic exposures to low levels of dimethoate have more significant effect on fish than acute poisoning. Biochemical changes induced by pesticide bring about metabolic disturbances, changes in behavior and physiology of the fishes.

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