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Original Research Article

Studies on Changes in Plasma and Muscle Protein in Xylachlor Induced in Teleostean Fish, *Channa marulius* (HAM.)

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ABSTRACT:
Studies on xylachor (a weedicide) induced changes in plasma and muscle protein content have been made in an air breathing fresh water murrel fish, *Channa marulius* (Ham.). It was observed that xylachlor at all the concentrations (1.0 to 2.5ppm) brought marked effect on the levels of plasma as well as muscle protein of the fish under experiment causing a gradual decrease in the value as compared to control upto 96hrs of treatment in both sexes, thus indicating the deteriorated nutrient value of the fish exposed to xylachlor. The reason and mechanism of such changes have been discussed in this paper.

Keywords: Xylachlor, Muscle and plasma protein, Fish.

INTRODUCTION

Aquatic weeds are unwanted vegetations; if left unchecked may chock the water body is posing a serious menace to pisciculture (Yasmin, 2019).

Weedicides have proved successful in the control of weeds in aquaculture system on one hand and health hazards in fishes, on the other hand (Verma and Kumari, 2016) scanty reports are available (Verma and Kumari, 2016; Yasmin, 2019) on the effect of Linuron and phosalone (both Weedicides) on fish physiology but nobody has made any study till now on the effect of xylachlor on fish physiology as such this is a new venture.

The best way of eradication of weed in chemical as compared to mechanical, manual and biological. It is apprehended that xylachlor is damaging the roots of weeds but details are not available. Aquatic organisms respond to pesticidal stress by changing the biochemical composition and by altering physiological phenomena (Katz et al. 1969).

Fish undergo a number of biochemical changes under stressful situations and mobilize their body constituents by changing enzymic patterns for survival under adverse conditions. Any xenobiotic, especially pesticides, affect the activities of biologically active molecules such as lipids, aminoacids co-enzyme and other proteins containing sulphur, phosphorus and nitrogen (Jha, 1991).

In addition, it is an established fact that plasma allows a free movement of the corpuscles whereas corpuscles use the circulating plasma as transport vehicle. The plasma contains substances like

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carbohydrates, protein fats, vitamins and hormones etc. which vary as per the physiological state of the cell.

In view of the above facts and the fact that biochemical alterations under stress conditions occur much before any drastic cellular and systemic dysfunctions are manifested, biochemical studies in toxicology assume much significance. Bano et al. (1982), Ramalingam and Ramalingam (1982) and Mishra and Behera (2019) have reported decease in protein content in different tissues in diverse fish species after the treatment of various toxicants. Below an attempt is being made to study the effect of a weedicide, Xylachlor on changes in muscle and plasma protein in teleostean fish, *Channa marulius* (Bloch).

MATERIAL AND METHODS

Live specimens of *Channa marulius* (Ham) were procured through local fish dealers at Patna. They were transported to the laboratory, treated with $KMNO_4$ solution (0.1%) for few minutes and then transferred to glass aquarium. Unhealthy and injured fishes were rejected. Experiments were performed after a minimum acclimatization period of seven days in the laboratory. Before starting any experiment toxicity values of Xylachlor (a weedicides, 2-chloro-N- (2, 3-dimethyl phenyl)-N-(1-methyl ethyl) acetamide) were calculated by the method as described by APHA (2012) and the experiments were conducted at sublethal concentrations (as illustrated in Table-1). Based on the probit analysis, LC_{50} values of Xylachlor for this fish were found to be 3.236, 2.570, 2.359 and 1.675, and 2.014 mg. respectively for 24,48,72,96 and 120 hrs exposures.

The mucle protein was estimated in *Channa marulius* (Ham.) by the method as described by Kumari (2014) using Folin ciocalteau reagent. The plasma protein was determined by Biuret method as described by Varley (1982). The difference of significance, if any, between control and experimental fishes were calculated by Student's t-test at the level of 5%.

RESULTS

The data showing the effect of Xylachlor at different concentrations and hours of exposure on changes in muscle protein and plasma protein in both the sexes of *Channa murulius* (Ham.) are presented in Table 1.

Table 1: Showing muscle protein (g/100g wet weight) and plasma protein (g/100ml of blood) of *Channa marulius* (Ham.) at different concentrations and hours of treatment of Xylachlor

Concentration (Xylachlor)	Hrs of Treatment	Males		Females	
		MP	PP	MP	PP
1.0 ppm	C	6.693	12.060	5.692	11.370
	24	6.580	11.865	5.578	11.205
	48	6.526	11.515	5.543	10.845
	72	6.457	11.005	5.459	10.567
	96	6.331	10.651	5.427	10.239
1.5 ppm	C	6.731	12.412	5.823	11.665
	24	6.588	12.208	5.579	11.495
	48	6.491	11.730	5.495	11.015
	72	6.375	11.346	5.430	10.691
	96	5.787	10.775	5.187	10.188

2.0 ppm	C	6.773	12.295	5.770	11.550
	24	6.541	12.023	5.540	11.300
	48	6.443	11.809	5.450	11.090
	72	5.203	11.435	4.300	10.733
	96	5.084	10.373	4.088	9.857
2.5 ppm	C	6.807±0.11	12.225±0.23	5.808±0.17	11.505±0.32
	24	6.576	11.581	5.575	10.890
	48	5.638	11.410	4.837	10.777
	72	4.893	9.669	4.188	9.371
	96	4.186±0.16*	8.281±0.11*	3.285±0.13*	8.206±0.22*

MP=Muscle Protein; PP = Plasma Protein
N=6; water Temp. 28.5±1.0^{0}C; ±=sem; *significant (P=<0.05); C=Control; x = Xylachlor treated.

The perusal of this table indicates that - Biochemically it was observed that the Xylachlor at all the concentrations exerted marked effect on the level of plasma protein of the fish under experiment causing a gradual but mostly non-significant decrease in the values from the controlled conditions upto 96 hrs of treatment in both the sexes. The tabulated data of male and female fishes were represented mean ± sem in the control as well as 96hrs PPM. The value of muscle protein also in both the sexes slowed a gradual decrease from the controlled condition upto 96 hrs of Xylachlor treatment.

DISCUSSION

Few reports are available as to the effects on the level of plasma protein of various chemicals and environmental condition are given here under:-

Akela (1983) report that the heat stress at 35°C caused a gradual fall in the level of plasma protein in both the sexes of *clarias latrachus* with increasing time interval after its application.

Delahunty and De Vlaming (1979) recorded that the plasma protein of *Carassius auratus* exposed to lower temperature was significantly greater than the level in fish maintained under warm temperature.

Bano (1982) Reported that Aldrin treatment at 0.1, 0.2, 0.5 and 1 ppm for 12, 60 & 132 hrs on *Clarias batrachus* caused a gradual fall in the level of serum proein. Longer exposure (60 and 132 hrs) period exhibited a rapid fall in its value.

Ram and Sathyanesan (1984) reported reduction in liver and ovarian protein by exposing *Channa panctatus* to mercury.

Agrawal (1982) reported that lithium poisoing brought about a significant increase in total plasma protein after 96 hr of exposure in *H. fossilis*.

Sharma (1989) (vide Lal, 1999) reported decline in serum protein in *Clarias batrachus* under metallic stress in the early phase of exposure due to higher level of mercuric chloride.

Bano, et al. (1981) studies the effect of DDT on the protein level of *Clarias batrachus* and found its value lower in all experimental fishes than in the control. In the present study lowering in the levels of Plasma protein due to Xylachlor treatment from the controlled conditions upto 96 hrs of treatment may be associated with excessive loss either due to nephrosis or to the reduced protein synthesis. When carbohydrate sources of glucose are deplected protein are utilized for glucose production which evidently lead to a faster and irreversible reduction in plasma protein.

Harper (1987) reported that decrease in tissue proteins and lipids might be partly due to their utilization in cell repair and

tissue organization with the formation of lipoproteins, which are important cellular consituents of cell membranes, and cell organelles present in cytoplasm.

According to Jha (1991), metal toxicity forces neoglucogenesis as a result the aminoacids supply, the necessary ketoacid to act as precursor for maintenance of carbohydrate metabolism through transmination and transdeamination reaction. Such possibility has also been advocated by Harper (1987).

Decline in total protein content in muscle, liver and kidney have also been reported by Jana and Bandopadhyay (1987) in *Channa punctatus* exposed to mercury, arsenic, lead, copper, cadmium and chromium. Thus, depletion in muscle protein of *Channa marulius* (Ham.) may be due to impaired or low rate of protein synthesis under metallic stress or due to their utilization in the formation of muco-proteins, which are eliminated in the form of mucus. Further, direct and/or indirect utilization of proteins for energy needs was also reported (Akela, 1983).

CONCLUSION

The present study indicated that biochemical alterations under xylachlor stress occurred, causing drastic cellular and systemic dysfunction as manifested by reduction in values of plasma and muscle protein at all concentrations (1.0 to 0.5 ppm) and exposure time (24 to 96 hrs) in this fish Channa marulius (HAM.)

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