

Effect of Pesticide Dicofol on Blood Protein Contents of *Channa Punctatus* (Bloch)

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Abstract

The decline in the total protein content of the investigated fish Bloch (*Channa punctatus*) due to the adverse effect of agricultural pesticide, dicofol (Kelthane) in hydro ecosystem leads the physiological and behavioural changes. It was observed that the decrease in percentage of albumin, globulin and albumin: globulin (A:G) ratio of the blood of the fish when the investigated species exposed to the lethal and sub-lethal concentration of the organo-chlorine dicofol pesticide in the same experimental conditions.

Key words: Dicofol; *Channa punctatus* (Bloch); albumin; globulin; Blood protein

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I. Introduction

Aquaculture is the fastest growing food production practice in the world in which the culture of air breathing fish for cheap and easily digestible protein supplement to human beings of BPL (below poverty line) category or lower strata of people of the society. Water bodies are exclusive habitat of fish fauna, which are known to be more sensitive to biocidal doses. Further, it is also known that most fish show a sharply defined threshold response to pesticide concentration. Though several workers have surveyed preventive levels of different pollutants in fish for calculating the possible danger for human health, caused by consumption of such affected fish, but the source of getting information about the effects of such pollutants does not cover all round effect on fish physiology. Hence, this study is devoted to assess the loss of protein in the blood as well as flesh of fish *C. punctatus* exposed to Dicofol or Kelthane.

II. Materials and Methods

Sufficient number of healthy and living specimens of *Channa punctatus* (Bloch.) of similar body weight (35-50 gm) were procured from the local market of Chapra town of Saran district of Bihar and brought to the laboratory in large buckets containing ground water & covered net cloths. They were treated with terramycin solution (15 mg/l) in ground water for 48 hours, washed with water and then treated with aqueous solution of potassium permanganate (2mg/l) for 15 minutes to remove ectoparasites, fungi & other dermal infections. After proper washing the fish were acclimatized for 10-15 days & were fed with goat liver, pieces of earthworms or tubifex daily at least 2 to 3 hours prior to change of groundwater. Fresh blood samples were collected directly from heart puncture or from the caudal artery by severing the tail. The blood sample was spun in a centrifuge, and all the red blood cells (R.B.C.) moved to the bottom of the tube leaving the clear blood plasma on top. Between the blood plasma and the packed RBCs, there were platelets and leucocytes.

Used Reagents : By mixing 5.0 ml of 25% aqueous NaOH solution with 1.0 mL of 2% of CuSO₄ solution (aqueous), Burette reagent was prepared which is a full strength reagent. For preparing half strength equal volume of distilled water was added to full strength reagent.

III. Results & Discussion

Total Protein: The total protein of the normal fish varied in between 3.89 ± 0.10 & 4.49 ± 0.12 gm/dl in control group. The fish exposed to lethal (1.55 ppm) & higher sub-lethal concentration (0.78 ppm), a gradual & statistically significant decrease ($P < 0.05$ & $P < 0.01$) was noticed at 96 and 240 hr. (3.46 ± 0.11 & 2.94 ± 0.12 gm/dl i.e.; 16.22 & 28.88% in 1.55 ppm) and at 960 and 1440 hr (3.50 ± 0.12 & 2.98 ± 0.10 gm/dl in 0.78 ppm concentrations respectively, whereas in the fish exposed to lowest sub-lethal concentration i.e. 0.19 ppm, the decrease was found statistically significant ($P < 0.05$) at 1440 hr. of exposure (3.47 ± 0.13 gm/dl) when compared with that of the overall average normal value.

Albumin in Blood: In the normal fish blood albumin content varied in between 2.75 ± 0.08 to 3.05 ± 0.12 gm/dl with an overall average value of 2.90 ± 0.09 gm/dl The fish exposed to 1.55 ppm, the albumin content gradually decreased ($P < 0.05$ & $P < 0.01$) at 96 hr & 240 hr of exposures (2.45 ± 0.10 & 2.10 ± 0.11 gm/dl

respectively), whereas in sub-lethal concentrations i.e. 0.78 & 0.19 ppm concentrations, a gradual increase were observed up to 96 hr and thereafter it decreased which was found statistically significant ($P < 0.05$ & $P < 0.01$) at 480 hr (2.59 ± 0.09 & 2.18 ± 0.13 gm/dl in 0.78 ppm with maximum decrease up to 2.00 ± 0.11 gm/dl at 1440 hr, of exposure) and in 0.19 ppm the decrease was found statistically significant ($P < 0.01$) at 1440 hr. of exposure (2.29 ± 0.11 gm/dl) when compared with average normal value of the albumin in blood.

Globulin: The globulin content in the normal fish blood varied between 1.15 ± 0.05 & 1.44 ± 0.08 gm/dl with overall average value of 1.22 ± 0.07 gm/dl. The fish exposed to lethal concentration i.e. 1.55 ppm, the globulin content in the blood gradually decreased & the decline was found statistically significant ($P < 0.01$) at 240 hr of exposure (0.84 ± 0.06 gm/dl). However in the sub-lethal concentrations 0.78 & 0.19 ppm, an initial increase was observed, which was found statistically significant at 240 hr in 0.19 ppm concentration only (1.66 ± 0.10 gm/dl), followed by a decrease in the later stages of exposure in both the concentrations, but it was not found statistically significant at any stage when compared with that of the normal value.

A:G Ratio: The A:G ratio of the normal fish varied in between 2.12 to 2.81 with the overall average value of 2.40%. The fish exposed to lethal concentration i.e. 1.55 ppm, the A:G ratio initially increased at 24 hr of exposure i.e. 2.81% followed by a decrease up to 2.42% at 96 hr and again a slight increase i.e. 2.50% at 240 hr of exposures. In sub-lethal concentrations i.e. 0.78 & 0.19 ppm, an initial increase was recorded at 24 hr. of exposure followed by a decrease after 96 hour of exposure but the increase/ decrease was not found more or less than 0.76%.

A large number of papers appeared on the serum protein levels in different fish and their changes due to certain environmental factors by several workers with contradictory results (Haider, 1970, Kumari, 1990, Gupta, 2003). Several workers like Kumari (1990) in *H. fossilis* exposed to sevin, Kumar (1999) in *H. fossilis* exposed to dimethoate and fenvalerate have reported a significant decline in total protein content in the blood of the fish. On the other hand Siddiqui & Siddiqui (1973) have reported a gradual increase in protein content. Sharma & Jain (2008) in *L. rohita* exposed to endosulfan, malathion and chlorpyrifos observed that long term exposure induce synthesis of stress proteins in the body tissues to combat anxiety.

In the present study, the total protein content in the blood of *C. punctatus* exposed to lethal & sub lethal concentrations has been found significantly decreased at 96-240 hr & 960-1440 hr respectively, while albumin content in lethal concentration gradually decreased and decline became significant at 96-240 hr but in sub lethal concentrations an initial increase up to 96 hr followed by a significant decline from 480 hr onwards was noticed. Similarly, globulin content in lethal concentration significantly declined at 96-240 hr while in sub-lethal concentrations it significantly increased at 96 hr followed by a decline but not statistically significant, when compared to their normal value. However, the A:G ratio increased up to 24 hrs (2.81%) followed by a decline at 96 hr (2.42%) & then slightly increased at 240 hr (2.5%) while in sub-lethal concentrations an initial increase followed by a decline has been recorded but the increase / decrease were not found more or less than 0.76% depended on concentration & exposure periods.

IV. Conclusions

It was observed that a change in the blood composition of fish brought the physiological and behavioural changes. The total protein percentage content albumin, globulin and A : G ratio of the blood in investigated *Channa punctatus* (Bloch) fish decreased when they were exposed to lethal and sub-lethal concentrations of the organo-chlorine pesticide Dicofol (Kelthane) in the experimental conditions.

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Conflicts of interest

The authors declare no conflict of interest.

Table -1
Serum total Protein, Albumin, Globulin & A : G ratio in *C. punctatus* exposed to Dicofol (Kelthane)

Concentration (ppm)	Exposure Hour (hr)	Total Protein (gm/dl)	Albumin (gm/dl)	Globulin (gm/dl)	AG ratio	% of total Protein
Control	24	4.12 ± 0.17	2.85 ± 0.10	1.27 ± 0.04	2.24	-
1.55		3.96 ± 0.19	2.92 ± 0.08	1.04 ± 0.07	2.81	-4.12
0.78		4.24 ± 0.17	3.10 ± 0.10	1.14 ± 0.06	2.72	-2.66
0.19		4.30 ± 0.20	3.20 ± 0.14	1.10 ± 0.09	2.91	4.12
Control	96	4.49 ± 0.12	3.05 ± 0.12	1.44 ± 0.08	2.12	-
1.55		$3.46 \pm 0.11^*$	$2.45 \pm 0.10^*$	1.01 ± 0.09	2.42	-16.22
0.78		4.38 ± 0.22	2.99 ± 0.09	1.39 ± 0.10	2.15	6.05

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0.19		4.52±0.18	3.14±0.12	1.29±0.12	2.27	9.44
Control	240	4.26±0.15	2.97±0.08	1.29±0.09	2.30	-
1.55		2.94± 0.12**	2.10±0.11**	0.84±0.06**	2.50	-28.81
0.78		4.25±0.13	2.85±0.10	1.40±0.08	2.03	2.90
0.19		4.38±0.21	2.72±0.13	1.66±0.10*	1.64	6.05
Control	480	3.89±0.10	2.75±0.08	1.05± 0.05	2.62	-
1.55		-	-	-	-	-
0.78		4.04±0.17	2.59±0.09*	1.45±0.09	1.79	-2.18
0.19		4.16±0.20	2.68±0.10	1.48±0.06	1.81	0.73
Control	960	3.96±0.16	2.93±0.05	1.04±0.07	2.81	-
1.55		-	-	-	-	-
0.78		3.50±0.12*	2.18±0.13**	1.32±0.10	1.65	-15.25
0.19		3.62±0.17	2.56±0.08	1.26±0.08	2.03	-12.35
Control	1440	4.04±0.13	2.83±0.09	1.21±0.07	2.34	-
1.55		-	-	-	-	-
0.78		2.98±0.10**	2.00±0.11**	0.98±0.06	2.04	-27.84
0.19		3.47±0.13-	2.29±0.11**	1.18±0.08	1.54	-15.98
Over all average of Normal values		4.18±0.14	2.90±0.09	1.22±0.07	2.40	

References

- [1]. Haider, G. 1970 : Haematologische Beobachtungen an Regenbogenforellan (*Salmo gairdnesi*) II. Der. Blutzuk. Z. Fish. N. F., 18 : 209-216.
- [2]. Kumari, R. 1990 : Effect of Some toxic solutions on the respiration of an air breathing fish, *H. fossilis* (Bloch) PhD. Thesis, Bihar Univ., Muzaffarpur (India)
- [3]. Gupta, V. 2003 : Toxicological assessment of fenvalerate (A parathyroid biocide) on a freshwater fish. Ph.D. Thesis, B.R.A. Bihar Univ. Muzaffarpur (India)
- [4]. Kumar, N. 1999 : Effect of few insecticides on the gills of an air breathing fish. Ph.D. Thesis, L. M. N. Univ., Darbhanga (India)
- [5]. Siddiqui, A.Q. & Siddiqui, N. 1973 : Effect of asphyxiation the chemical constituents of blood plasma of *clarias batrachus*. Ind. J. Zool., 1 (1) : 47-48.
- [6]. Sharma, M. & Jain, K. L. 2008 B : Protein profile of liver tissue in the fish, *Labeo rohita* (Ham.) through the chronic exposure to some pesticides and their subsequent withdrawal. Ibid : 13-18.
- [7]. Sharma, M. & Jain, K. L. 2008 A : Alteration in metabolic enzyme activity of Muscle tissue in the fish, *cyprinus carpio* (L.) on chronic exposure to some pesticides. J. Aquacult. 16 : 7-12.

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