



ORIGINAL ARTICLE

Effect of 2, 4-D on Blood Serum Proteins and Albumin of *Channa punctatus* (Bloch.)

Ranjana Chauhan¹ and Bhagyalaxmi Sengar²

¹ Deptt. of Zoology, Kr. R.C.M. (P.G.) College, Mainpuri

² Deptt. of Botany, Kr. R.C.M. (P.G.) College, Mainpuri

Email: drranjanachauhan1965@gmail.com

ABSTRACT

In the present work toxic effect of 2,4-D herbicide observed in *Channa punctatus* (Bloch.) LC_{50} (Median tolerance limit) values of 2,4-D dichlorophenoxy acetic acid (organochlorine) calculated are- 1687.5, 1437.5, 1250.0 and 1212.5 ppm for 24, 48, 72 and 96 hrs respectively to fish *Channa punctatus*. Blood serum proteins and albumin of *Channa punctatus* has observed after 2,4-D stress for three sublethal concentrations 400, 600 and 800 ppm at different time interval of 24, 48, 72 and 96 hrs. In these observations serum protein and albumin content of *Channa punctatus* decreases with an increase in time exposure and concentration of 2, 4-D toxicant.

Key words: Blood Serum, Protein, Albumin, *Channa punctatus*

Received: 5th Sept. 2017, Revised: 10th Oct. 2017, Accepted: 16th Oct. 2017

©2017 Council of Research & Sustainable Development, India

How to cite this article:

Chauhan R. and Sengar B. (2017): Effect of 2, 4-D on Blood Serum Proteins and Albumin of *Channa punctatus* (Bloch.). *Annals of Natural Sciences*, Vol. 3[4]: December, 2017: 32-34.

INTRODUCTION

Advancement in the field of agricultural sciences, latest techniques involving much more effective synthetic pharmaceutical compounds in the form of biocides and a considerable growth of industries has resulted in severe toxication of fresh water bodies. The short term effect of pollution on aquatic life is due to the lack of oxygen in water, heavy load of organic matter from sewage and other sources; and the long term due to the gradual accumulation of toxic substances in the body of aquatic fauna specially fish and thereby causing a great problem to mankind for whom these are one of the main sources of food.

In spite of all odds the use of chemical herbicides is increasing leaps and bounds in recent years. The reason being their utilization as effective weed killers, economic with regard to the cost of application, quick availability and non-toxic attitude towards warm blooded animals. The most chemical 2,4-D dichlorophenoxy acetic acid is an organochlorine herbicide. It is extremely mobile and acts as a respiratory inhibitor.

Obviously being a poikilotherm, the fish become a target where subsequent transport of the weedicide either by general body surface or through respiratory pathways to various tissues of different organ system, result in acute metabolic disorders leading finally to death.

Haematology is one of the most reliable tools in the hands of clinician and is now the Chief source for knowing the pathologic condition of the animal. It also plays a major role in the maintenance of health of the animals. Haematological characteristics have been proved to be valuable in monitoring responses of fish on exposure to lethal and sublethal concentrations of toxicants. Therefore, the present investigation correlates the 2,4-D induced alteration in serum albumin and protein in *Channa punctatus* (Bloch.) Similar work has been done by Wani, *et. al.* (2010) on *Channa punctatus* (Bloch.)

MATERIAL AND METHODS

The fresh water air breathing fish, *Channa punctatus* (Bloch.) ranging from 14 to 20 cm. in length and 40 to 100 gms in weight were selected from the local fish market, Agra. They were carefully examined for any injury and treated with 1% solution of $KMnO_4$ for few minutes to get rid of any dermal infection and kept in large glass aquaria measuring 75 cm x 37.5cm x 37.5cm. In the beginning of experiment LC_{50} of 2, 4-D is calculated by using bioassay method (APHA, *et. al.*, 1981) 2000 ppm. is highest concentration at which all the fish died in 24 hrs. and 1125 ppm is the lowest concentration at which all fish survived for 24 hours, so within this range six concentration 1750, 1625, 1500, 1375, 1256 and 1125 ppm of 2,4-D were selected and the values in each concentration were recorded by bioassay method and statistically processed by method (Sendecor, 1961).

For biochemical estimation three sublethal concentrations of 2, 4-D 400, 600 and 800 ppm were selected and values recorded after a time interval 24, 48, 72 and 96 hrs and compared with the control set values. For the separation of serum blood sample is collected in sterilized plain glass tubes and left undisturbed for about an hour and tubes were centrifuged at 2500 rpm for about 30 minutes and serum was separated by pipette in plain air tight vial and stored in the freezer below $0^{\circ}C$ until used. The total serum protein and albumin was determined by the modified biuret and Dumas method (varley, 1980) and the test applied for the statistical calculation given by (Fischer, 1957).

RESULT AND DISCUSSION

In fresh water fish *Channa punctatus* LC_{50} value observed after different concentrations of 2,4-D at the time interval of 24, 48, 72 and 96 hrs. The survival no. shows a corresponding decrease with the increase in the concentration and time exposures. LC_{50} value record for 24, 48, 72 and 96 hrs and 1687.5, 1437.5, 1250 and 1212.5 ppm respectively. Total protein and albumin content in serum in *Channa punctatus* shows a decreasing trend with the increase in time and concentration of 2, 4-D which may be due to decrease in protein metabolism. Which in turn decrease the body weight and muscle mass that results in reduced activity with enormous extrusion of mucous which practically covers the whole body surface and hinders the exchange of gases resulting in the deficiency of oxygen in the blood which in turn affects the general physiology of the body resulting in death.

Different concentration of 2, 4-D 400, 600 and 800 ppm shows alteration in protein and albumin contents of serum in control fish. The average value of total serum protein content is 7.47 gm/100ml which is higher than that reported by saad, *et. al.*, (1973) in *Tilapia Zillii*, Bills and Hunn (1976) in Coho Salmon, verma, *et. at.*, (1979) in *Saccobranchus fossilis* and lower than that by Goel and Garg (1980) in *Channa punctatus* (Table- 1)

Table 1: Serum Protein Content in *Channa punctatus* in Control and in Experimental Conditions with 2, 4-D 80% E.C.

S.No.	Concentration (ppm)	Exposure time in hours			
		24	48	72	96
		Range Mean + S.E.	Range Mean + S.E.	Range Mean + S.E.	Range Mean + S.E.
1.	Control	6.57 - 8.64 7.47 + 0.38	6.57 - 8.64 7.47 + 0.38	6.57 - 8.64 7.47 + 0.38	6.57 - 8.64 7.47 + 0.38
2.	400	6.45 - 8.52 7.28 + 0.35*	6.25 - 8.25 7.07 + 0.34*	6.08 - 8.05 6.90 + 0.37*	6.00 - 7.92 6.77 + 0.36*
3.	600	6.29 - 8.28 7.11 + 0.34*	6.12 - 8.08 6.97 + 0.33*	5.94 - 7.97 6.76 + 0.36*	5.75 - 7.92 6.62 + 0.37*
4.	800	6.15 - 8.12 6.98 + 0.34*	6.01 - 7.95 6.79 + 0.35*	5.83 - 7.82 6.59 + 0.35*	5.66 - 7.76 6.51 + 0.38*

S.E. = Standard Error of the Mean.

* = Non-Significant

In *Channa punctatus* serum protein content decreases from 7.28 to 6.51 gm/100 ml after exposure of different concentrations and time exposures of 2, 4-D. Decrease in serum protein has also been reported by Bills and Hunn (1976) in Coho salmon exposed to malachite green, Verma, *et. al.*, (1979) in *Saccobranchnus fossilis* due to chlordane and Goel and Garg (1980) in *Channa punctatus* due to 2, 3, 4-Triamino azobenzene. While increase in protein content has reported by Saad, *et. al.* (1973) in *Tilapia zillii* due to sewage and industrial waste water and Shakoory, *et. al.*, (1976) in *Channa punctatus* due to malathion, dieldrin and endrin.

Table 2: Serum Albumin Content in *Channa punctatus* in Control and in Experimental Conditions with 2, 4-D 80 E.C.

S.No.	Concentration (ppm)	Exposure time in hours			
		24	48	72	96
		Range Mean + S.E.	Range Mean + S.E.	Range Mean + S.E.	Range Mean + S.E.
1.	Control	2.99 - 3.45 3.18 + 0.08	2.99 - 3.45 3.18 + 0.08	2.99 - 3.45 3.18 + 0.08	2.99 - 3.45 3.18 + 0.08
2.	400	2.93 - 3.41 3.15 + 0.09*	2.88 - 3.35 3.08 + 0.08*	2.80 - 3.24 3.03 + 0.08*	2.75 - 3.20 2.97 + 0.08*
3.	600	2.90 - 3.37 3.09 + 0.08*	2.85 - 3.30 3.05 + 0.08*	2.78 - 3.23 2.98 + 0.08*	2.71 - 3.17 2.93 + 0.08*
4.	800	2.85 - 3.31 3.06 + 0.08*	2.80 - 3.25 3.00 + 0.08*	2.72 - 3.19 2.94 + 0.08*	2.67 - 3.09 2.90 + 0.07*

S.E. = Standard Error of the Mean.

* = Non-Significant

The average serum albumin content in *Channa punctatus* is 318 gm/100 ml which is similar to that reported by Raizada and Singh (1980) in *Cirrhina mrigala*, Shandilya (1982) in *Labeo rohita*, while higher than that by Menon (1952) in *Macrones quilla*, Shandilya (1982) in *Clarius batrachus* and lower than by Saad, *et. al.*, (1973) in *Tilapia zillii*. Decrease in the serum albumin content from 3.15 to 2.90 gm/100ml due to the toxic effect of 2,4-D decreasing trend in serum albumin content has also been reported by Saad, *et. al.*, (1973) in *Tilapia zillii* due to sewage and industrial waste (Table 2).

The decrease in the serum protein and albumin content is due to decrease in protein anabolisms that result in decrease in the body weight and muscle mass.

ACKNOWLEDGEMENT

We wish to thanks to Dr. D.P.S. Bhati, Retd. Prof. & Head, Deptt. of Zoology, Dr. B.R. Ambedkar University, Agra for his valuable guidance and timely suggestions.

REFERENCES

1. APHA, AWWA and WPCF (1981): Standard methods for the examination of water and waste water. 13ed, New York.
2. Bills T.D. and Hunn J.B. (1976): Changes in the blood chemistry of Coho salmon exposed to malachite green (Fungicide). The prog. Fish cult. 38(4): 214-216.
3. Goel A.K. and Garg V. (1980): 2, 3, 4-Triaminoazobenzene induced hematobiochemical anomalies in fish, *Channa punctatus* Bull, Environ. Contam. Toxicol, 25: 136-141.
4. Saad M.A.H., Ezzat A. and Shabana M.B. (1973): Effect of pollution on the blood characteristics of *Tilapia zillii* water air and soil pollution, 2: 171-179.
5. Shandilya S. (1982): Effect of certain biocides on the structure and chemical composition of the blood in *clarius batrachus* (Linn.) and *Labeo rohita* (Ham.) Ph.D. Thesis, Agra University, Agra.
6. Verma S.R., Bansal S.K., Gupta A.K. and Dalela R.C. (1979): Pesticide induced haematological alterations in a fresh water fish, *Saccobranchnus fossilis*. Bull Environ contam. Toxicol, 22: 467-474.
7. Wani C.D.N., Nagpur N.S., Kumar R., Kushwaha B., Kumar P. and Latra W.S. (2010): Lethal concentration and toxicity stress of carbosulfan glyphosphate and atrazine to fresh water air breathing fish *Channa punctatus* (Bloch.). International Aquatic Research, 105-111.