

Haematological Studies of Freshwater Fish, *Clarias batrachus* (L.) when Exposed to Endosulfan

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Abstract: Present study deals with haematological effect of pesticide Endosulfan on fish *Clarias batrachus*. In this study when fish *Clarias batrachus* was exposed to various concentrations of Endosulfan for 96 hrs, haematological parameters such as Red blood cell count (RBC), Haemoglobin percentage (Hb), Packed Cell Volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC) were decreased while White blood cell count (WBC) and blood glucose was increased as compared to control.

Keywords: *Clarias batrachus*, Endosulfan, Blood, Haematological, Glucose.

1. Materials and Methods

In the present investigation, live specimens of *Clarias batrachus* were brought from Kaigaon Toka, near Aurangabad city (Maharashtra) to laboratory without any mechanical injury. The fishes were maintained in glass aquaria and were allowed to acclimatize for about four weeks before using for the test. The bioassays were conducted according to the procedure described by APHA (1992).

To determine acute effect of Endosulfan on haematological parameters, ten fishes were exposed at various concentrations of Endosulfan for 96 hrs. The concentrations selected for Endosulphan were 0.1203 ppm, 0.1311 ppm, 0.1420 ppm, 0.1530 ppm, 0.1639 ppm, and 0.1748 ppm.

After completion of short term exposure i.e. 96 hrs at various concentrations of Endosulphan, blood from caudal peduncle of fish was collected with the help of sterile disposable syringe. The blood was collected in bulb and heparin was used as anticoagulant. Various parameters like red blood corpuscles (RBC), white blood corpuscles (WBC), haemoglobin (Hb), Packed Cell Volume (PCV), (Mean Corpuscular Volume) MCV, (Mean Corpuscular Haemoglobin) MCH, (Mean Corpuscular Haemoglobin Concentration) MCHC and blood glucose were calculated. Simultaneously, a control tank was also maintained.

Study of total red blood cell count (RBC) and white blood cell count (WBC) was carried out by using Haymem's solution and WBC diluting fluid manually by using an Improved Neubauer haemocytometer. Haemoglobin was determined by using Sahli's haemoglobinometer method (Sahli 1962). The blood glucose was estimated by using phenol sulphuric acid method and by Electronic Glucometer. The Packed Cell Volume (PCV) was determined by the method described by Wintrobe (1967).

The blood parameters such as Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin Concentration (MCHC) and Mean Corpuscular Haemoglobin (MCH) were calculated as:

$$\begin{aligned} \text{MCV (in cubic microns)} &= \frac{\text{PCV}}{\text{RBCs in millions per cu mm}} \times 10 \\ \text{MCHC (in per cent)} &= \frac{\text{Hb in gm per 100 ml}}{\text{PCV}} \times 100 \\ \text{MCH (in picograms)} &= \frac{\text{Hb in gm per 100 ml}}{\text{RBCs in millions per cu mm}} \times 10 \end{aligned}$$

2. Results

During acute treatment, fish *Clarias batrachus* was exposed to different concentrations of Endosulfan pesticide for 96 hrs. The concentrations selected for Endosulfan were 0.1203 ppm, 0.1311 ppm, 0.1420 ppm, 0.1530 ppm, 0.1639 ppm and 0.1748 ppm. During (96 hrs) exposure to Endosulfan it was observed that haematological parameters such as red blood corpuscles (RBC), haemoglobin (Hb), packed cell volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin Concentration (MCHC) and Mean Corpuscular Haemoglobin (MCH) decreased while white blood corpuscles (WBC) and blood glucose increased (Table 1.1) as compared to control. During the acute toxicity test to Endosulfan it was observed that change in haematological parameters were concentration dependent, that is as concentration of Endosulfan was increased haematological parameters decreased except white blood corpuscles and blood glucose which were found to be increased.

3. Discussion

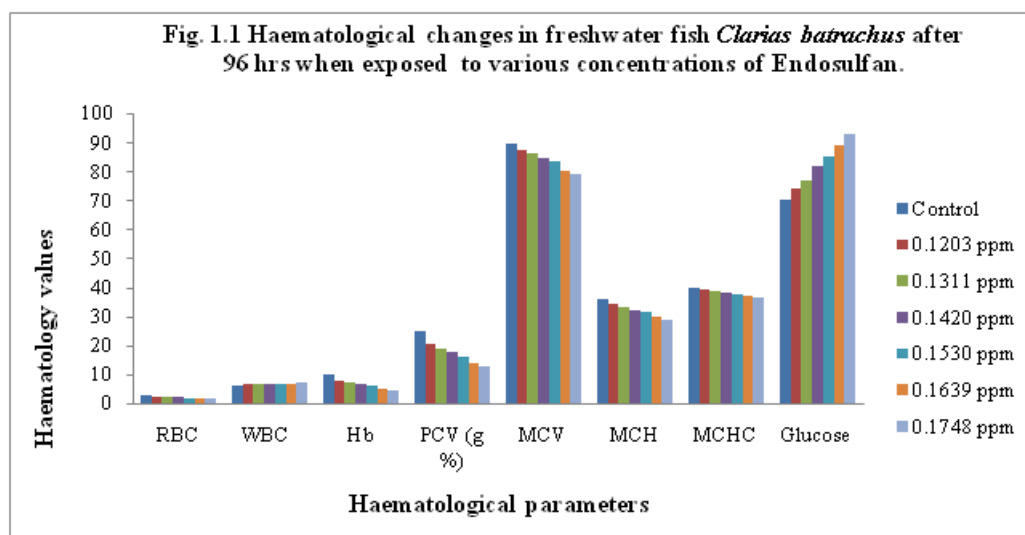
In the present study fish *Clarias batrachus* was exposed to various concentrations of Endosulfan for 96 hrs (table 1.1) and it was observed that red blood cell count (RBC), Hb percentage and packed cell volume had decreased as compared to control. The reduction was dosage dependent i.e., as concentration of Endosulfan increased the RBC count, Hb percentage & Packed cell volume declined.

Amit kumar Singh *et al.*, (2010) studied effect of Endosulphan to median lethal concentration (5.38 ppm) for 24 hrs on air breathing fresh water fish *Clarias batrachus* and observed significant decrease in red blood cell count, Haemoglobin, and Haematocrit (PCV). Similar results were observed in the present study.

Lipika Patnaik *et al.*, (2006) observed significant reduction in Erythrocytes, Haemoglobin and PCV (packed cell volume), in fish *Clarias batrachus* when exposed to pesticide Carbaryl for 96 hrs, similar results were observed in the present study.

Table 1.1: Haematological Changes in fresh water fish *Clarias batrachus* after 96 hrs when exposed to various concentrations of pesticide Endosulfan.

Parameters	control	Endosulfan concentrations in ppm					
		0.1203	0.1311	0.1420	0.1530	0.1639	0.1748
RBC $\times 10^6$ mm ³	2.80 \pm 0.02	2.35 \pm 0.01	2.20 \pm 0.02	2.08 \pm 0.01	1.92 \pm 0.02	1.75 \pm 0.02	1.60 \pm 0.03
WBC $\times 10^3$ mm ³	6.31 \pm 0.04	6.41 \pm 0.03	6.5 \pm 0.02	6.65 \pm 0.03	6.8 \pm 0.04	6.9 \pm 0.03	7.01 \pm 0.02
Hb (g/dl)	10 \pm 0.1	8.0 \pm 0.1	7.3 \pm 0.1	6.7 \pm 0.1	6.0 \pm 0.2	5.2 \pm 0.1	4.6 \pm 0.1
PCV (g %)	25 \pm 0.25	20.5 \pm 0.10	19 \pm 0.25	17.6 \pm 0.15	16 \pm 0.28	14 \pm 0.20	12.6 \pm 0.16
MCV (μ m)	89.28 \pm 0.255	87.23 \pm 0.055	86.36 \pm 0.355	84.61 \pm 0.315	83.33 \pm 0.59	80 \pm 0.23	78.75 \pm 0.475
MCH (pg)	35.71 \pm 0.10	34.042 \pm 0.28	33.18 \pm 0.155	32.21 \pm 0.325	31.25 \pm 0.71	29.71 \pm 0.235	28.75 \pm 0.085
MCHC (%)	40.00 \pm 0.00	39.02 \pm 0.30	38.42 \pm 0.02	38.06 \pm 0.24	37.5 \pm 0.595	37.14 \pm 0.185	36.50 \pm 0.33
Glucose (mg/100ml)	70 \pm 2	74 \pm 2	77 \pm 2	82 \pm 2	85 \pm 2.5	89 \pm 3	93 \pm 3.5



Abdul Majid Tak *et al.*, (2014) studied acute toxicity of pesticide Dichlorvos at different concentrations on fresh water fish, *Cyprinus carpio* and observed reduction in red blood cells, haemoglobin content and Packed Cell Volume (PCV) the decrease observed was dose dependant.

In the present study fish *Clarias batrachus* was exposed to various concentrations of Endosulfan for 96 hrs (table 1.1). It was observed that in fishes exposed to Endosulfan white blood corpuscle count had increased as compared to control, the increase was dosage dependent.

Amit kumar Singh *et al.*, (2010) studied effect of Endosulfan to median lethal concentration (5.38 ppm) for 24 hrs on air breathing fresh water fish *Clarias batrachus* and observed increase in WBC count.

G. V. Venkataraman *et al.*, (2013) when exposed fish *Clarias batrachus* to different concentrations of Malathion for 24, 48, 72 and 96 hrs, and observed that with increase in concentration and with increase in exposure time

leucocytes (WBC) count increased, the increase was dose dependant.

In present study fish *Clarias batrachus* was exposed to various concentrations of Endosulfan for 96 hrs (table 1.1) it was observed that Mean Corpuscular volume (MCV), Mean corpuscular Haemoglobin Concentration (MCHC) and Mean Corpuscular Haemoglobin (MCH) were decreased as compared to control. The reduction was dosage dependent i.e., as concentration of Endosulfan increased the Mean Corpuscular volume (MCV), Mean corpuscular Haemoglobin Concentration (MCHC) and Mean Corpuscular Haemoglobin (MCH) declined.

Lipika Patnaik *et al.*, (2006) observed significant reduction in Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Concentration (MCHC) and Mean Corpuscular Hemoglobin (MCH) in fish *Clarias batrachus* when exposed to pesticide Carbaryl for 96 hrs.

G. V. Venkataraman *et al.*, (2013) exposed fish *Clarias batrachus* to different concentrations of Malathion for 24,

48, 72 and 96 hrs and observed that with increase in concentration and exposure time Mean Corpuscular Value (MCV) values decreased while MCHC and MCH value increased, the increase or decrease was dose dependant.

In the present study *Clarias batrachus* was exposed to various concentrations of Endosulfan for 96 hrs (table 1.1) and it was observed that blood glucose increased as compared to control. The increase in blood glucose was dosage dependent, as concentration of Endosulfan increased blood glucose also increased.

Amit kumar Singh *et al.*, (2010) studied effect of Endosulfan to median lethal concentration (5.38 ppm) for 24 hrs on air breathing fresh water fish *Clarias batrachus* and observed increase in plasma glucose.

Kori-Siakpere *et al.*, (2007) reported plasma glucose elevation in African catfish *Clarias gariepinus* when exposed to pesticide Paraquat.

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