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**Research paper**

# Toxicity of parathion on erythrocyte count of an air-breathing fish *Clarias batrachus* (Linn.)

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**Abstract:** Organophosphorus pesticides are used in agriculture as insecticide and pesticides due to their rapid biodegradibility nature to control pest but their broad spectrum of harmful effects extends far. The present study deals with the toxic effect of parathion on total erythrocyte count of an air–breathing fish *Clarias batrachus*. In different sublethal toxicity [2ppm , 4ppm, 6ppm and 8ppm] of parathion for 96 hours to *C. batrachus*, a gradual and significant decrease in Red Blood Corpuscles (RBC) count was observed. The mean RBC count in control and treated female fish were higher than male was noticed. The decrease in RBC count due to toxicity of parathion might be due to interference in metabolism of blood producing organs of fish.

**Keywords:** Toxicity, RBC count, *Clarias batrachus***,** organophosphorus, parathion.

**Introduction:**

Normal water conditions are necessary for proper fish culture. Organophosphorus pesticides, once used indiscriminately, alter physico–chemical properties of water and they make the fish life difficult. Parathion (an organophosphorus insecticide) has been found to be highly toxic not only to human and insects but also to fisher and to those animals, which constitute the food of fishes. It is used against a wide range of insects and mites on crops.

Blood is the primary target of pesticidal action (Kennedy et al., 1970). Alterations in hematological parameters due to water pollutants in poikilothemic animals particularly in fishes have been well established in recent years ( Banerjee and Kumari, 1988: Kumari *et al.*, 2006) But the toxic effect of parathion in fishes in general and in an air breathing fish *Clarias batrachus* in meager. Hence, the objective of the present study was to analyse the effect of commonly used insecticide parathion on

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total erythrocyte count (TEC) of a common air breathing fish *Clarias batrachus.*

## Materials and Methods:

In the present study, the common air breathing fish *Clarias batrachus* (both male and female) were used as experimental animals. Fishes were procured from the local market. Fishes were acclimatized at laboratory conditions for a forthight with proper supply of the fish feed. Parathion, an organosphorus compound was used as chemical stressor. The experiments were designed at control and at different sublethal concentrations of parathion for 96 hrs. i.e. 2 ppm, 4 ppm, 6 ppm and 8 ppm taking 10 fishes of almost same weight (male and female separately) in each group. A clean dry plastic syringe containing EDTA was used to take out blood form the cauda dorsalis of the fishes. The counting of total number or RBC was made with the help of Thoma–Zeiss heamocytometer with improved Neubauer ruling as decribed by Darmady and Davenport (1954).

Student's 't' test was applied to find the significance of variations in the mean number of erythocytes between control (C) and 2 ppm ($T_1$), 4 ppm ($T_2$), 6 ppm ($T_3$) and 8 ppm ($T_4$) respectively as well as between $T_1$& $T_2$& $T_1$& $T_3$& $T_1$& $T_4$& $T_2$& $T_3$& $T_2$& $T_4$ and $T_3$&$T_4$

## Result and Discussion:

Table 1 & 2 exhibited the enumeration of total erythrocytes in control group of *Clarias batrachus* and in four other group of fishes subjected to 2 ppm, 4 ppm, 6 ppm and 8 ppm of parathion concentration. The range of enumeration of erythrocytes in control group of male fishes was in between $2.323 \times 10^6/mm^3$ to $4.661\times10^6/mm^3$ whereas the mean count was found to be $2.7733 \pm 0.2075\times10^6/mm^3$. Itwas overserved that the number of erythrocytes was higher in female fishes in comparision to male fishes of *Clarias batrachus***.** In control group of female fishes, the minimum and maximum numbers of erythrocytes were counted to be $3.006\times10^6/mm^3$ and $3.676\times10^6/mm^3$ respectively whereas the mean number of eryhrocytes in all the ten experimental female fishes was found to be $3.2439\pm0.079\times10^6/mm^3$.

**Table 1**. **Effect of Parathion toxicity on total count of erythrocyte of male *Clarias batrachus***

| S. No. | Erythrocyte count in $10^6/mm^3$ | | | | |
|---|---|---|---|---|---|
| | Control | Parathion concentration (in ppm) | | | |
| | | 2.0 | 4.0 | 6.0 | 8.0 |
| 1. | 3.231 | 2.801 | 1.809 | 1.000 | 0.521 |
| 2. | 3.154 | 2.785 | 1.528 | 1.201 | 0.562 |
| 3. | 3.006 | 2.666 | 1.846 | 0.982 | 0.612 |
| 4. | 3.152 | 2.543 | 1.925 | 0.971 | 0.712 |
| 5. | 3.004 | 2.884 | 1.863 | 0.827 | 0.617 |
| 6. | 3.679 | 2.901 | 1.562 | 0.817 | 0.432 |
| 7. | 3.188 | 2.156 | 2.000 | 2.527 | 0.416 |
| 8. | 3.276 | 2.655 | 1.852 | 0.764 | 6.512 |
| 9. | 3.007 | 2.454 | 1.761 | 0.652 | 0.631 |
| 10. | 3.742 | 2.123 | 1.956 | 0.783 | 0.400 |

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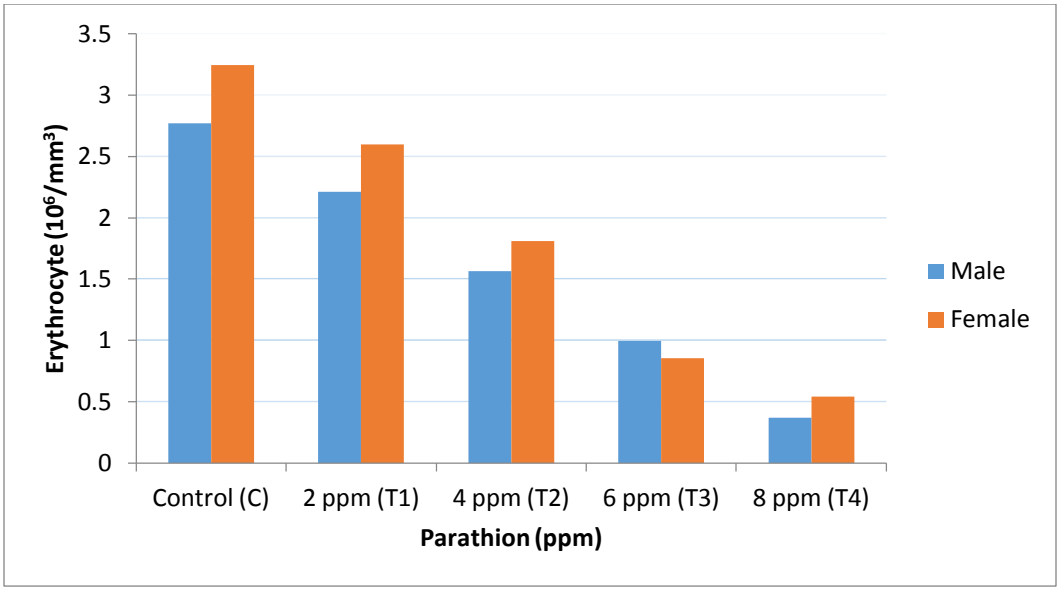
**Table 2. Effect of Parathion toxicity on total count of erythrocyte of male *Clarias batrachus***

| SL. No. | Erythrocyte count in $10^6$/mm$^3$ | | | | |
|---|---|---|---|---|---|
| | Control | Parathion concentration (in ppm) | | | |
| | | 2.0 | 4.0 | 6.0 | 8.0 |
| 1. | 4.661 | 3.360 | 1.99 | 1.221 | 0.222 |
| 2. | 2.972 | 2.412 | 2.021 | 0.992 | 0.199 |
| 3. | 2.478 | 2.317 | 1.856 | 1.153 | 0.181 |
| 4. | 2.437 | 2.088 | 1.654 | 1.144 | 0.576 |
| 5. | 2.326 | 2.066 | 1.605 | 1.022 | 0.474 |
| 6. | 2.714 | 2.184 | 1.505 | 0.861 | 0.354 |
| 7. | 2.323 | 2.972 | 1.382 | 0.642 | 0.423 |
| 8. | 2.651 | 1.971 | 1.371 | 1.007 | 0.352 |
| 9. | 2.500 | 1.463 | 1.254 | 0.988 | 0.431 |
| 10. | 2.671 | 1.305 | 1.026 | 0.900 | 0.486 |

In the present study the parathion toxicity of different sublethal concentration (2 ppm, 4 ppm, 6 ppm and 8 ppm) caused a gradual and significant decrease in the total number of erythrocytes (TEC) of both male and female groups of *Clarias batrachus* (Table 1 & 2 and Fig. 1).




**Effect of Parathion toxicity on total count of erythrocyte of *clarias batrachus***

The average number of TEC in 2 ppm, 4ppm, 6ppm and 8ppm parathion toxicated male fishes were 2.2138 ± 0.185×$10^6$/mm$^3$, 1.5666 ± 0.0972×106/mm$^3$. 0.993±0.185× $10^6$/mm$^3$and 0.3689 ± 0.04012 × $10^6$/mm$^3$ respectively. Similarly, parathion toxicity of varying concentration caused gradual and significant fall in the number of RBC in

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female fishes. The mean total erythrocyte count in 2 ppm, 4ppm, 6ppm and 8ppm parathion toxicated female fishes were found $2.5968 \pm 0.083 \times 10^6/mm^3$, $1.802 \pm 0.046 \times 10^6/mm^3$, $0.8524 \pm 0.057 \times 10^6/mm^3$ and $0.5415 \pm 0.031 \times 10^6/mm^3$ respectively. The diffrence in the mean number of TEC were found highly significant in most of the cases in 't' tests among different group of fishes (Table–3)

**Table 3. Mean, Standard Error of Mean and t-value of Erythrocyte count of *Clarias batrachus* treated with Parathion**

| Test | Mean ± SEM | | Comparison between | Mean ± SEM | |
|---|---|---|---|---|---|
| | Male | Female | | Male | Female |
| Control (C) | 2.77 ± 0.28 | 3.2439 ± 0.0793 | $C - T_1$ | 2.012* | 5.609**** |
| 2 ppm ($T_1$) | 2.214 ± 0.185 | 2.597 ± 0.084 | $C - T_2$ | 5.263**** | 15.565**** |
| 4 ppm ($T_2$) | 1.567 ± 0.973 | 1.810 ± 0.047 | $C - T_3$ | 8.337**** | 24.367**** |
| 6 ppm ($T_3$) | 0.993 ± 0.050 | 0.852 ± 0.058 | $C - T_4$ | 11.372*** | 31.722**** |
| 8 ppm ($T_4$) | 0.369 ± 0.041 | 0.542 ± 0.031 | $C - T_2$ | 3.095*** | 8.191**** |
| | | | $T_1 - T_3$ | 6.367**** | 17.129**** |
| | | | $T_1 - T_4$ | 9.741**** | 22.985**** |
| | | | $T_2 - T_3$ | 5.243**** | 12.860**** |
| | | | $T_2 - T_4$ | 8.912**** | 19.684**** |
| | | | $T_3 - T_4$ | 9.726**** | 4.730**** |

Not significant ($p<0.10$), **Significant ($p<0.05$), ***Significant ($p<0.01$)
****Highly significant ($p<0.001$)

Khalid and Javaid (1978) observed that the number of RBC count was decreased in *Channa punctatus* after DDT treatment. A gradual and significant decrease in TEC in both the sexes *of Clarias batrachus* induced to various sublethal concentrations of parathion in the present observation might be due to disturbance in the metabolic activities of the hemopoietic organs as suggested by Mahajan & Juneja, 1979. Similar findings were recorded by Goel *et al.*, (1984) in *Clarias batrachus* after application of alchlor toxicity. The fall in total erythrocyte count might be due to increase in the rate of erythrocyte destruction (Agrawal and Srivastava, 1980). In human beings, red blood cells are reported to be lysed by drugs and infections. The susceptibility of red cells to hemolysis by these agents is increased by deficiency of the enzyme glucose 6- phosphate dehydrogenase, which catalyzes the initial step in the oxidation of glucose via the hexose monophosphate pathway (Ganong, 2003).

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**References:**
Kennedy, H. D., Lafayette, L. Eller and David Walsh F. (1970) Technical paper of Bureau of Sport Fisheries and Wild Life. 53, 3.
Joshi, B. D. (1982) Changes in the some haematological values of *Clarias batrachus* following folidol treatment in 25°C. Ind. J. Zool. 23(2), 93-98.

Banerjee, V. and Kumari, K. (1988) Effect of zinc, mercury and cadmium on erythrocyte and related parameters in the fish *Anabas testudineus*. Environ. & Ecol (3), 737-739.

Kumari, R., Sah, N. P., Paul, D. K., Kumari, P. and Thakur, G. K. (2006) Toxicological effects after chronic exposure of urea and single super phosphate on corpuscular haematology of an air breathing fish *Channia punctatus* (Bloch). J. Haematol. & Ecotoxicol. 1(2), 7-11.

Darmady, E. M. and Davenport, S. G. T. (1954) Haematological technique for medical laboratory technicians and medical students. J.& M. Churchill Ltd. London pp. 27-46 **.**

Khalid, L. P. and Javaid, M. Y. (1978) Effect of sublethal doses of DDT and dieldrin on the blood of *Channa punctatus* (Bloch.). Pak. J. Zool. 8(1), 413-150.

Mahajan, C. L. and Juneja, C. J. (1979) Effect of aldrin on peripheral blood of fish Statics *Channa punctatus* (Bloch). Ind. J. Envirol. Hlth. 21(2), 162-172.

Goel, A. K. Kalpana, S. and Agrawal, V. P. (1984) Alchlor toxicity to a freshwater teleost *Clarias batrachus.* Current Science. 53(19), 1050-1052

Agrawal, P. and Srivastava, A. K. (1980) Haematalogical response in a fresh water to xperimental manganese poisoning. Toxicology. 17, 97-100.

Ganong, W. F. (2003) Review of Medical Physiology. The Mc Grew Hill Companies. 21st Ed. pp.912