

RESPONSE OF ORGANOPHOSPHATE PESTICIDE ACEPHATE INDUCED STRESS IN BIOCHEMICAL AND HEMATOLOGICAL INDICES OF *LABEO ROHITA*

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Abstract

The study aims at assessing the effects of an organophosphate pesticide acephate (75% SP) on Indian Major Carp *Labeo rohita* on the basis of the results of sub lethal toxicity tests, biochemical estimations and hematological indices. Experimental carp were exposed to the pesticide acephate (75% SP) in the concentration of 0.0004ml/lit in 24h sublethal toxicity test by static bioassay method. The results of experimentation were compared with the results of control group. In hematological profile the experimental group of carp showed a significant ($P < 0.01$) increases number of erythrocytes MCH, MCV, MCHC, and decrease in the segmented neutrophils, granulocytes, and leucocyte count. The exposure of *Labeo rohita* to 10g/lit acephate caused significant shifts in hematological and biochemical profile.

Keywords: Acephate, Biochemical estimations, Hematological indices, *Labeo rohita*.

1. Introduction

India is one of the countries of intensive agricultural production and therein high use of pesticide. The state of Andhra Pradesh and Maharashtra reported highest rates of pesticide contamination in India. An organophosphate (OP) or phosphate ester, are organophosphates which includes Deoxyribonucleic acid (DNA) and Ribonucleic acid (RNA), and many cofactors that are essential for life. Acephate, (O, S-Dimethyl Acetylphoramidothioate) is of the organophosphate family. Acephate is commonly used in the treatment of aphids, leaf miners, caterpillars,

sawflies, thrips, fire ants, etc. It is used by agricultural community on vegetables, fruits, berries, cotton, tobacco, and herbs. It is also used in the horticulture and forestry. Extensive use of pesticide poses hazard to the aquatic life by altering the habitat behavior, growth, and reproductive potential (URL.1). Acephate has been in use since 1970s and was registered by EPA in 1973. The United States uses 4-5 million pounds of acephate annually. Due to their lower persistence in the environment, organophosphates are used judiciously to control wide variety of agricultural pests and ectoparasite in fish. Among the aqua fauna, fish forms an important group attributed to its nutritive value (Casida, 1964; Coppage and Mathews, 1975; Kabeer Ahamed and Rao, 1980; Klaverkamp and Hobden, 1980).

Environmental pollutants, occupational exposures and lifestyle, have been explored as possible contributors to these changes (Homan et al., 2007). The uptake from water occurs by intimate contact with the medium that carries the chemicals in solution or suspension and because fish has to extract oxygen from the medium by passing enormous volumes of water over their gills. Organophosphates are powerful neurotoxic chemicals as they inhibit acetyl cholinesterase activity (Casida, 1964; Coppage and Mathews, 1975 al., 1980; Rath and Mishra, 1981).

2. Material and Methods:

Chemical- Name: Acephate

Chemical name: O, S dimethyl acetyl -- phosphoramidothioate;

Trade name: Asataf 75% SP;

Chemical family: Organophosphate (soluble in water).

Experimental Protocol:

Freshwater fish *Labeo rohita* has been selected as test animal in the present study. Fingerlings of this fish were collected from Fishseed Rearing Centre, Rankala, Kolhapur, unit of Department of Fisheries, Government of Maharashtra and were acclimatized with sufficient dechlorinated tap water for 7 days. The fishes were starved for 24 hours prior to estimation to avoid any influence of differential feeding. Tables, Figures and Equations

3 Biochemical study:

After exposure period, the healthy fishes were taken out and were sacrificed; organs like Intestine, Gill, Liver, and Muscle were pooled out from each group. Total protein content was estimated by Lowry's method (Lowry's et al., 1951).

Hematological Analysis:

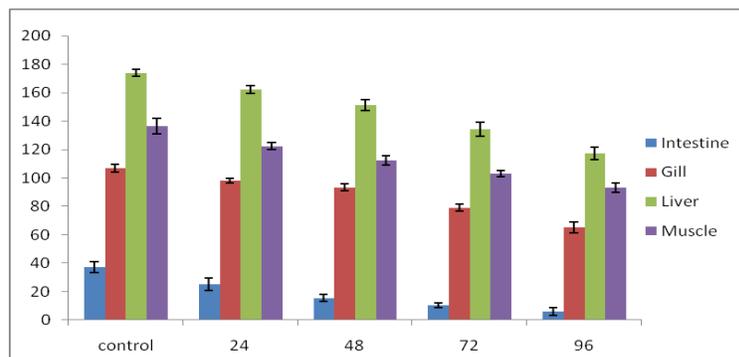
The blood was collected from caudal vein, and transferred in heparinised tubes. At the time of sampling the smear was prepared on glass slide. It was air-dried, fixed in 96% ethanol for 30 min and stained with Wright staining for 10 minutes. Smears were observed for leukocyte differential count under a compound microscope. Hematological indices studied were erythrocyte count (RBC), Hemoglobin (Hb), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Count (MCHC) and differential count of leukocyte (Klont, 1994).

RESULTS:

Table-1 Changes in the total protein content exposed to Acephate in tissues of freshwater fish *Labeo rohita* ($\mu\text{g/gm}$ weight of tissue)

| Protein | Intestine | Gill | Liver | Muscle |
|---------|------------------|------------------|------------------|------------------|
| control | 37.36 \pm 3.84 | 106.6 \pm 2.74 | 173.9 \pm 2.66 | 136.4 \pm 5.29 |
| 24hr | 25.18 \pm 4.5 | 98.02 \pm 1.55 | 162.2 \pm 2.64 | 122.3 \pm 2.42 |
| 48hr | 15.5 \pm 2.49 | 93.4 \pm 2.27 | 151.1 \pm 3.77 | 112.4 \pm 3.19 |
| 72hr | 10.18 \pm 1.64 | 79.1 \pm 2.42 | 134.5 \pm 4.95 | 103 \pm 2.12 |
| 96hr | 6.04 \pm 2.56 | 65.32 \pm 3.93 | 117.4 \pm 4.44 | 93.04 \pm 3.30 |

Fig.-1) Changes in the total protein content exposed to Acephate in tissues of freshwater fish *Labeo rohita* ($\mu\text{g/gm}$ weight of tissue)



Significantly different at $p < 0.01$, according to one way ANOVA.

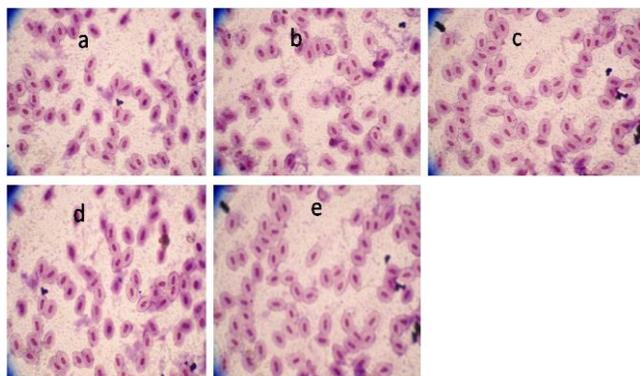
Table-2: Erythrocyte profile of Acephate in *Labeo rohita* of following exposures

Table-3: Leucocyte profile of Acephate in *Labeo rohita*

| Indices | Unit | Control | 24hr | 48hr | 72hr | 96hr |
|------------|-----------------|---------------|---------------|---------------|----------------|---------------|
| WBC | mm ³ | 14660 ±887 | 16850 ±755 | 20100 ±605 | 23700 ±1300 | 24660 ±887 |
| Neutrophil | % | 20.3 ±2.4 | 26.8 ±3.1 | 43.2 ±5.2 | 48.6 ±6.2 | 52.4 ±2.8 |
| Lymphocyte | % | 68.5 ±5.6 | 72.2 ±4.6 | 74.6 ±2.2 | 84.7 ±5.6 | 87.5 ±5.6 |
| Monocyte | % | 0.78 ±0.62 | 0.86 ±0.57 | 0.98 ±0.53 | 1.01 ±0.01 | 1.07 ±1.2 |
| Eosinophil | % | 0.11 ±0.33 | 0.12 ±0.04 | 0.12 ±0.20 | 0.11 ±0.23 | 0.20 ±0.20 |

of following exposure.

Plates of leucocytes cells



a:- control; b:- 24hrs; c:- 48hrs; d:- 72hrs; e:- 96hrs.

Discussion:

The physiological and biochemical characteristics of fish blood are modified by environmental changes (Atamanalp M et al.,2002).The hematological parameters like RBC,WBC, Hb and Hematological indices like MCV,MCH, and MCHC are frequently used to assess the health status of fish. In the present study RBCs (Hb, MCV, MCH, MCHC) significantly decreased and WBCs are significantly increased in *Labeo rohita*. Similar results were observed by Ko:pru:s et al.,2006 in *Catla catla* treated with cypermethrin. Saxena K.K et al., 2002 reported that the RBC count decrease may depend on age

| Indices | Unit | Control | 24hr | 48hr | 72hr | 96hr |
|---------|------|------------------|------------------|------------------|------------------|------------------|
| RBC | m/ul | 6.30 ±0.01 | 5.89 ±0.24 | 5.01 ±0.121 | 4.89 ±0.002 | 4.02 ±0.061 |
| Hb | g/dl | 2.012 ±0.052 | 1.901 ±0.012 | 1.841 ±0.210 | 1.621 ±0.001 | 1.292 ±0.012 |
| MCV | fl | 108.12 ±0.152 | 107.31 ±0.120 | 106.01 ±0.018 | 105.80 ±0.054 | 104.00 ±0.064 |
| MCH | Pg | 59.16 ±0.31 | 58.68 ±0.48 | 56.98 ±0.21 | 55.01 ±0.41 | 54.21 ±0.20 |
| MCHC | g/dl | 39.18 ±0.124 | 38.14 ±0.410 | 37.41 ±0.178 | 36.61 ±0.41 | 34.86 ±0.05 |

of animal, stress condition, sex, and availability of food in a particular medium in fish. Svoboda et al., 2001 showed Diazinon exposure in carp led to decrease in RBC, Hb, MCV, MCH, whereas the neutrophil and granulocyte,lymphocyte levels increased but conversely there was no significant effect on monocyte and eosinophils.

Conclusion:

In the present study, results obtained shows that organophosphate acephate exert significant effect on the level of total protein content in intestine, gill, liver, and muscles at 24,48,72,96 hours exposure period of acephate and also changes in hematological indices like RBCs and WBCs in *Labeo rohita*.

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