EFFECT OF INDOFIL TOXICITY ON MCHC OF
Channa punctatus (BLOCH.)

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ABSTRACT

The present investigation deals with the study of effect of fungicide, Indofil on the freshwater teleost fish, Channa punctatus (Bloch.) to study the effect of the sub-lethal concentration of Indofil on certain haematological parameter i.e.; MCHC (Mean Corpuscular Haemoglobin Concentration). Indofil is a carbamate fungicide and its LC50 has been calculated by the log-dose/Probit regression line method (Finney, 1971) and was recorded as 10.96 ppm. Sub-lethal concentration (8ppm) of Indofil was given to four experimental groups for 24, 48, 72 and 96 hrs. Indofil showed a non significant to very highly significant decrease in MCHC.

Key Words : Fish, Channa punctatus, Fungicide, Carbamate, Indofil, Sub-lethal, Haematological, MCHC

INTRODUCTION

The natural surrounding of man and other organisms is commonly known as environment and it affects the organism’s existence. By environment we mean not only our immediate surrounding but also a variety of issues connected with human activity, productivity, basic living and its impact on natural resources.

World’s human population mainly depends on crop for its food. Food is the basic need for the survival of human beings, but human beings have altered the balance of nature by developing agriculture for their own interest that is ‘food’. The pests destroy about 75% of the world’s crop every year. Hence, there is a great economic loss and this emphasizes the need for using pesticides (pesticide has the meaning ‘the killer of pest’).

The degradation of aquatic system is a wide phenomenon originated from the intense population and from the corresponding increase in agricultural practices as well as industrial and domestic activities. Agriculture sector is the largest user of pesticides and so they are the major cause of concern for aquatic environment because of their toxicity, persistency, and tendency to accumulate in the organisms. The impact of these pesticides on aquatic organisms is due to the movement of pesticides from various diffuse or point sources. These pesticides are posing a great threat to aquatic fauna especially to fishes, which constitute one of the major sources of protein rich food for mankind.
Fish occupy high trophic level in accumulating various pesticides in the aquatic environment. Aquatic organisms are in great danger due to the pollution of pesticides. The fish serves as bio-indicator of water quality and the impact of the pesticides can be well understood by analyzing either blood or serum of the fish, because blood is a pathophysiological reflector of whole body. Any change in the composition of the blood disturbs the metabolic activities of the body. Therefore, blood parameters are an asset in diagnosis of the structural and functional status of body organs exposed to toxicants. The haematological characteristics are useful in assessing the health and stress responses in fish. Toxic effects of organochlorine and organophosphate pesticides have been studied by many authors, but the prevalence of carbamate pesticides in the aquatic environment has become a matter of great concern.

**MATERIAL AND METHODS**

The experimental fishes, *Channa punctatus*, were procured from the local vicinity. The average length and weight of *Channa punctatus* ranged from 14-16 cms and 60-70 g respectively. They were kept in clean large glass aquaria measuring 75 cms$\times$ 37.5 cms$\times$ 37.5 cms, at the temperature ranging from 30$^0$C-35$^0$C and each containing 25 L of water. The water was changed at every alternate day. The water was stored before one week to outcome unfavourable gases. The fishes were acclimatized to the laboratory conditions for one week prior to the experiment and they were fed on commercial fish food. The food was given daily two times and feeding was disrupted prior to 24 hrs of the experiment.

The fishes were grouped into five groups viz; A, B, C, D and E. Different concentrations (10, 20, 30 and 40ppm) of Indofil were given to A, B, C and D groups respectively. All groups were observed for 24, 48, 72 and 96 hrs respectively and mortality was recorded. LC$_{50}$ of Indofil has been calculated by the log-dose/Probit regression line method and was recorded as 10.96 ppm. Sub-lethal concentration (8ppm) of Indofil was given to four experimental groups (A, B, C and D) for 24, 48, 72 and 96 hrs respectively and E was left as control group.

Six fishes from each set control and treated were sacrificed for the blood haematological study. Treated fishes were sacrificed after 24, 48, 72 and 96 hrs respectively of exposure to 8ppm of Indofil. The blood was collected after severing the caudal peduncle of the living fish by a pair of fine scissors. The blood samples were taken in double oxalate vials. In each vial 2-3 drops of an anti-coagulant EDTA were added prior to collection of blood. The blood samples were analyzed individually for each fish.

The Mean Corpuscular Haemoglobin Concentration (MCHC) was calculated by the following formula—

\[ \text{MCHC} (\%) = \frac{\text{Haemoglobin concentration (gm %)}}{\text{Packed Cell Volume (\%)}} \times 100 \]

Student ‘t’ test was used for the Probit analysis.

**RESULTS AND DISCUSSION**

In *C. punctatus* the MCHC ranges from 21.76-29.29% with an average of 26.62%. In the present study a non-significant to very highly significant reduction in MCHC from 26.62% has been observed (Table-1). The reduction in MCHC has also been observed in *Channa punctatus*. The work was also supported by Thakur and Bais in *Heteropneustes fossilis* treated with aldrin and fenvalerate respectively.
Mean Corpuscular Haemoglobin Concentration (MCHC) is the mean concentration of haemoglobin (Hb)/100 ml of cells, as an index that is independent of the size of the red cells and therefore, is a true expression of Hb level. From the present study, it is assumed that reduction in MCHC induces hypohaemoglobinemia and may be correlated with reduced PCV and Hb concentration. Fungicide Indofil administration reduces erythropoiesis (formation of red blood cells) which in turn induces anaemia (PCV decreases in anaemia).

Table 1.

Mean Corpuscular Haemoglobin Concentration (MCHC) in *C. punctatus* after intoxication of Indofil

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>24 hrs</th>
<th>48 hrs</th>
<th>72 hrs</th>
<th>96 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (%)</td>
<td>26.62</td>
<td>26.42</td>
<td>26.24</td>
<td>25.67</td>
<td>18.02</td>
</tr>
<tr>
<td>S. Em.</td>
<td>1.2</td>
<td>0.6*</td>
<td>0.8*</td>
<td>0.9*</td>
<td>0.6**</td>
</tr>
</tbody>
</table>

S. Em. = Standard Error of mean  
* = Non significant (P>0.05)  
** = Very highly significant (P<0.001)

**CONCLUSION**

The morphological changes in the blood of *Channa punctatus* induced by the fungicide Indofil may be hazardous in many ways. These changes can reduce the growth rate and can affect the survival of eggs and embryos along with the behaviour of fish, causing lethargic condition and difficulty in respiration. Long term exposure to pesticides means a continuous health hazards for the population, protection against their effects needs sensitive markers of exposure.

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**REFERENCES**