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HAEMATOLOGICAL CHANGES INDUCED BY A PYRETHROID INSECTICIDE " FENVALERATE" IN CATFISH *CLARIAS GARIEPINUS.*

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ABSTRACT

The effect of the pyrethroid insecticide, fenvalerate, on some haematological parameters of the catfish (*Clarias gariepinus*) was investigated. Exposing fish to 1/10 LC_{50} of fenvalerate for one, 5 and 10 days induced a significant decrease in the haemoglobin content, haematocrit value and erythrocytes. On the other hand, the leucocytes count was increased. The minimal values were recorded in fish exposed to fenvalerate for 10 days. Total bilirubin and creatinine showed a significant increase in treated fish.

Key words : Pyrethroid insecticide - Haematological changes - *Clarias gariepinus*

INTRODUCTION

Insecticides are extensively used all over the world to control insect pests in agriculture and in public health. This denotes a high possibility that it contaminates the diet of man and his farm animals. Moreover, the wide spread of such substances cause a steady increase in pollution of water and pose a danger of toxic effects for aquatic life.

Pyrethroids represent a class of insecticides which showed excellent insecticidal properties with good biodegradability and they are highly active insecticides in considerable lower quantities compared to other insecticides (Narahashi,1971). Toxicity of pyrethroids was studied in different animals and it was found that these insecticides have neurotoxic (Souyri and Hoellinger, 1983) and genotoxic effects (Amer *et al.* 1993). The effect of pyrethroids on fish was studied by many investigators. Among the various effects are histopathological(Teh *et al* 2005),physiological (Kamalaveni *et al.* 2001) and haematological (Satyanarayan et al. 2004) effects in different fish.

As a matter of fact, blood serves as the most convenient indicator of the general condition of the animal body. Blood data including haemoglobin content and haematocrit value are valuable for biologists in assessing the pathological states. The present work was planned to study the effect of pyrethroid insecticide, fenvalerate, on the haematological parameters of the catfish *Clarias gariepinus* under laboratory conditions.

MATERIALS AND METHODS

Living samples of *Clarias gariepinus* were used in the present work, each weighing 500-650 g. The fish were kept in specially equipped aquaria(80 x 50 x 50 cm) which were continuously aerated by air pumps. The fish samples were kept for at least 48 hours in the tanks for acclimation. The fishes were provided with suitable food of algae and grass. Fenvalerate, a pyrethroid insecticide was used in the present study. The LC_{50} of fenvalerate at 48 hours was found to be 250 ug/L as obtained from the lethal curve.

The experimental fishes were divided into four groups.

The 1st group: 10 fishes were exposed to 1/10 LC_{50} of fenvalerate for one day exposure period. During this period, the dead fishes were immediately removed.

The 2nd group: 15 fishes were exposed to 1/10 LC_{50} of fenvalerate for 5 days.

The 3rd group: 15 fishes were exposed to 1/10LC_{50} of fenvalerate for 10 days

The 4th group: 10 fishes were used as controls.

Blood samples were collected from the fish into heparinized tube. Erythrocytes and leucocytes count were determined using improved Neubauer containing chambers according to the method of Hesser (1960). Heamoglobin content was determined using Oser (1964) technique. Heamatocrit value was estimated by the method of Snieszka (1960) using the heparinized microhaematocrjt centrifuge tubes. Total bilirubin was determined using the method of Sims and Horm (1958). Creatinine was measured using the method of Teitz (1979). The results were analyzed statistically using Student's -t test (Baily,1981) to compare all treated data against their control ones at probability level 0.05.

RESULTS AND DISCUSSION

Data in table (1) and figures 1-4 showed that there was a gradual decrease in erythrocyte count and haemoglobin content in fish exposed to fenvalerate. This decrease was significant ($P<0.05$) after 10 days to exposure to the insecticide. The haematocrit percentage was significantly decreased after 5 and 10 days. On the other hand, the leucocyte counts were found to increase and the increase became

significant after 5 and 10 days. Results in table (2) showed that bilirubin and creatinine increased in sera of fenvalerate-treated fish and this increase was significant ($P<0.05$) after 5 and 10 days.

Results observed in the present work are similar to those reported by many investigators who studied the haematological effects of insecticides on fish. Adhikar *et al.* (2004) reported that exposure of *Labeo rohita* to sublethal levels of cypermethrin and carbofuran resulted in significantly ($P<0.05$) lower values for erythrocyte count hemoglobin content and hematocrit compared with the control group. In contrast, there was a significant increase ($P<0.05$) in leukocyte count in the pesticide-treated group. Mean cell volume and mean cell haemoglobin increased in response to both pesticides. Satyanarayan *et al.* (2004) found that aldrin and dieldrin induced significant reduction in red blood cell count and haemoglobin content of the fish *Cyprinus carpio* and *Puntius ticto*, while packed cell volum showed decreasing trend with the increase in exposure period. Haemoglobin concentration ,packed cell volum and total erythrocyte count decreased in *Channa punctatus* exposed to cadmium and dimethoate separately and in combination (Shastry and Gupta 1994). Srivastava *et al.* (1994) reported that chlordecone insecticide induce significant decrease in erythrocyte count ,hemoglobin content and hematocrit content, whereas significant increase was observed in the total leukocytes count and clotting time. Collectively, depression in the erythrocytes count, haemoglobin content and haematocrit value recorded in the present work indicate that fenvalerate- treated fish were anemic. According to Lu (1985) anemia is due to (a) increased blood loss as a result of accelerated red cells destruction by haemolytic agents or rapid cell removal from an

abnormality of cell shape or overactivity of the spleen, (b) quantitative decrease in blood formation as a result of quantitative decrease in red marrow from aplasia (cessation of tissue formation) or quantitative decrease in marrow activity from deficiency of substances necessary for normal bone marrow activity. The decrease in haematocrit value observed in this work was probably due to haemolysis of red blood cells caused by fenvalerate.

Exposing fish to fenvalerate induced significant increase in bilirubin. Similarly, Jyothi and Narayan (1999) found that exposing catfish *Clarias batrachus* to carbaryl and phorate insecticides increased serum bilirubin. McClintic (1978) reported that among the causes of elevated bilirubin levels is the excessive destruction of red blood cells in cases of anemia and hemolytic disease. He added that when the hem fraction of the hemoglobin is destroyed the biliverdin is formed, then biliverdin undergoes a reduction to bilirubin which is released into the plasma.

The present results revealed also a significant increase in the blood creatinine in response to fenvalerate toxicity. This result is confirmed by reports of some authors who obtained similar results under the effect of different insecticides (Reddy and Yellamma,1991; Jyothi and Narayan 2000; Das and Mukherjee, 2003). It was speculated that the increase in blood creatinine might be due to impaired kidney function by this insecticide. This view was highly supported by Kluwe (1981) who indicated that an elevation of creatinine level in the blood is an indication of impaired kidney function.

Table (1): Average haematological measurments in control and fenvalerate-treated fish .

Parameters	Fish groups			
	Control	1day	5days	10days
RBCs (10^6/mm^3)	2.18 ±0.19	2.02±0.06	1.89±0.83	1.36±0.65*
Hb (g/dl)	9.40±1.18	8.10±1.60	6.93±1.91	4.20±0.17*
HCT%	20.30±1.4	19.60±1.5	15.30±0.96*	12.40±1.7*
WBCs (10^3/mm^3)	20.41±0.47	22.53±0.80	28.57±0.35*	39.16±0.17*

(*) :Significant at $p<0.05$

Table (2): Change in bilirubin and creatinine in control and fenvalerate-treated fish.

Parameters	Fish groups			
	Control	1day	5days	10days
Bilirubin mg/dl	1.2±0.5	1.4±0.7	1.8±0.4*	2.3±0.2*
Creatinine mg/dl	0.6±0.4	0.8±0.03	1.2±0.03*	1.8±0.04*

(*) :Significant at $p<0.05$

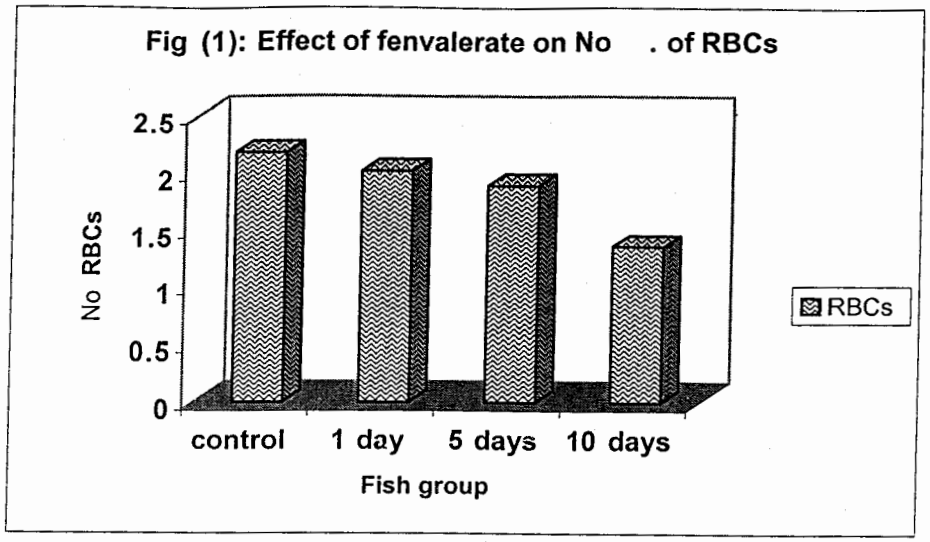
Fig (1): Effect of fenvalerate on No . of RBCs
No RBCs
2.5
2
1.5
1
0.5
0
control
1 day
5 days
10 days
Fish group
RBCs

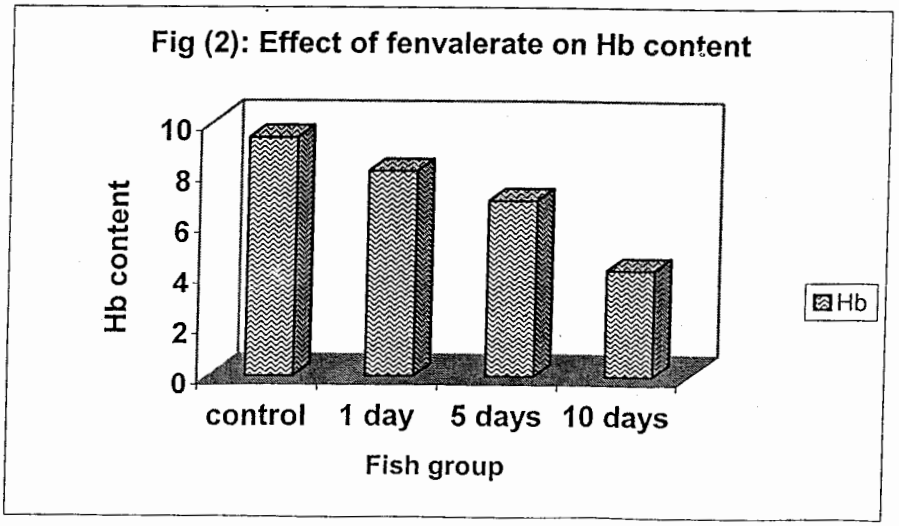
Fig (2): Effect of fenvalerate on Hb content
Hb content
10
8
6
4
2
0
control
1 day
5 days
10 days
Fish group
Hb

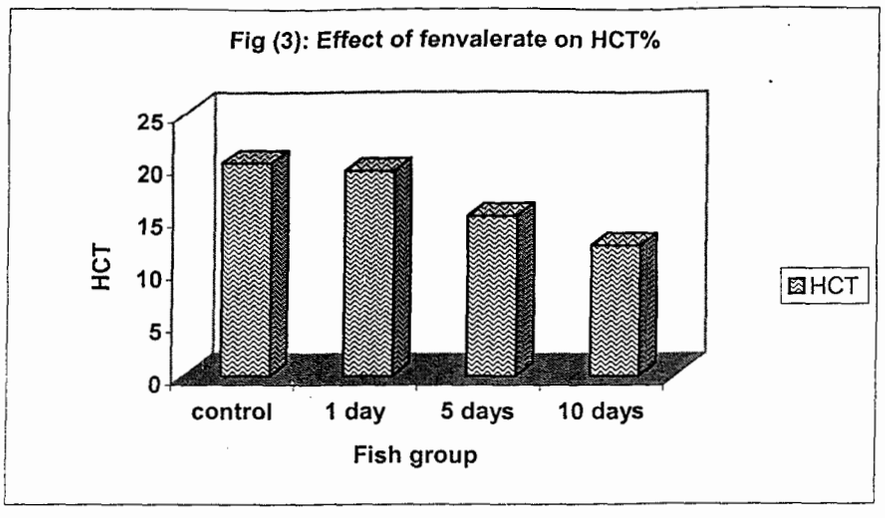
Fig (3): Effect of fenvalerate on HCT%
HCT
25
20
15
10
5
0
control
1 day
5 days
10 days
Fish group
HCT

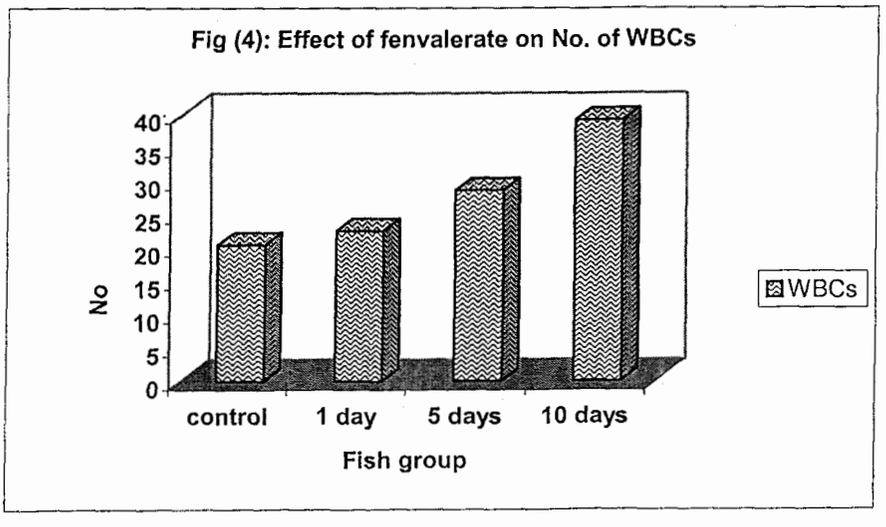
Fig (4): Effect of fenvalerate on No. of WBCs
No
40
35
30
25
20
15
10
5
0
control
1 day
5 days
10 days
Fish group
WBCs

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التغيرات الدموية المحدثة بمبيد البيروثرويد (فينفالريت) في سمكة القرموط لازير (كلارياس جاريبينس)

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المملكـــة العربية السعوديـــــــــــه

يستخدم مبيد البيروثرويد (الفينفالريت) فى مكافحة كثير من الحشرات وقد اظهر هذا المبيد سمية لعدة حيوانات منها الأسماك. درس البحث الحالي تأثير التعرض لمبيد البيروثرويد (الفينفالريت) على الدلالات الدموية لأسماك القرموط (كلارياس جاريبينس) عند تعرض الأسماك لجرعة لعشر الجرعة نصف المميتة لمدة يوم واحد وخمسة أيام وعشرة أيام أظهرت النتائج نقصاً فى عدد كرات الدم الحمراء وكمية الهيموجلوبين ونسبه الهيماتوكريت وكان النقص ذو دلالة معنوية بعد ١٠ أيام من التعرض للمبيد، كذلك أظهرت النتائج زيادة فى عدد كرات الدم البيضاء وكذلك زيادة فى كمية البلروبين والكرياتنين فى مصل الدم بعد التعرض للمبيد لمدة خمسة وعشرة ايام.