

RESEARCH ON THE CHANGES OF SOME PHYSIOLOGICAL PARAMETERS IN *RANA RIDIBUNDA* UNDER THE ACTION OF THE *ACTARA 25WG* INSECTICIDE

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Abstract

*In recent years, sustained research has been conducted on obtaining an efficient insecticide to fight against pests. Such an insecticide is supposed not to cause the resistance effect or to harm the environment. We investigated the action of such a product – Actara 25WG (in which the thiamethoxame is the active substance), in a concentration of 0.4mg/g body weight, on some physiological indices –number of erythrocytes, leukocytes, glycaemia level, cholesterol and triglycerides level – in *Rana ridibunda*. The animals used in the experiment were divided in four experimental lots: two lots of control individuals (first lot was kept at 4-6°C and the second lot at 22-24°C) and two experimental lots in which the animals were treated with 0.01 ml/g body weight Reldan 40EC and kept at 4-6°C, respectively at 22-24°C. The toxic was administrated with intraperitoneal shots (one shot every two days, in a scheme of three weeks). We observe a decrease in number of erythrocytes and leukocytes, a decrease in cholesterol level and an increase in glycaemia value while the triglycerides level remains unchanged.*

Keywords: thiamethoxam, erythrocytes, leukocytes, glycaemia, cholesterol, triglycerides

1. INTRODUCTION

The sensitivity of amphibians to chemical contamination has recently become a topic of interest as a result of reported declines in several amphibian populations [4]. Because many amphibians breed in bodies of water associated with agricultural areas that may receive heavy pesticide application, testing toxicity effects of agricultural pesticides on amphibians may be especially relevant.

Actara 25WG is a neonicotinoid insecticide active against a broad range of commercially important sucking and chewing pests and it has as its component the major active ingredient, thiamethoxam (25%). A comprehensive genotoxicity assessment (including bacterial mutagenicity, gene mutation, cytogenetic, unscheduled DNA synthesis, and mouse micronucleus tests) demonstrated that thiamethoxam was not genotoxic. Toxicology tests during development revealed that thiamethoxam was not a mutagen. Thiamethoxam's chemical structure is slightly different than the other neonicotinoid insecticides, making it the most water soluble of this family.

The product investigated in our experiments – Actara (250 mg/l of thiamethoxame) has been

initially introduced to control pests in the

cotton fields; this insecticide controls pests efficiently, being used for the protection of crops and vegetables against bed bugs, the Colorado potato beetle, thrips, aphides, flea beetles, whiteflies, stink bugs, etc [7].

The aim of the present work was to evaluate the Actara 25WG (thiamethoxam) effect upon some physiological parameters in *Rana ridibunda*.

2. MATERIAL AND METHODS

The animals used in the research were grouped into 4 experimental lots: control lot I composed of 18 copies of untreated *Rana ridibunda*, with an average weight of 45g, maintained in laboratory conditions at a temperature of 4-6°C in containers with tap water which was changed daily, lot II consists of 18 specimens of *Rana ridibunda*, with an average weight of 43g, maintained under the same conditions as lot I (at a temperature of 4-6°C) and treated for 3 weeks with Actara 25WG in concentration of 0.4mg/g per body weight; control lot III with 18 copies of untreated *Rana ridibunda*, with an average weight of 47g, maintained in laboratory conditions at a temperature of 22-24°C in containers with tap water which was

changed daily; lot IV consists of 18 specimens of *Rana ridibunda*, with an average weight of 50g, maintained under the same conditions as control lot III (at a temperature of 22-24°C) and treated for 3 weeks with a concentration of Actara 25WG 0.4mg/g per body weight.

The toxic substance was administered by intraperitoneal injection, one injection at 2 days for 3 weeks. Physiological indices studied are represented by the number of red blood cells (RBC), white blood cells (WBC), blood sugar, and cholesterol, triglycerides level. At sacrifice, blood was collected by cardiac puncture and analyzed for number of erythrocytes, leukocytes, triglycerides and cholesterol using standard automated methods [5].

3. RESULTS AND DISCUSSION

The values of physiological indices provide parallel analysis of changes occurring at the two heat levels.

The analysis of Figure 1 shows that the number of erythrocytes decreases at temperatures of 4-6°C and 22-24°C as compared to the control value, when using the treatment with Actara 25WG for a period of 3 weeks.

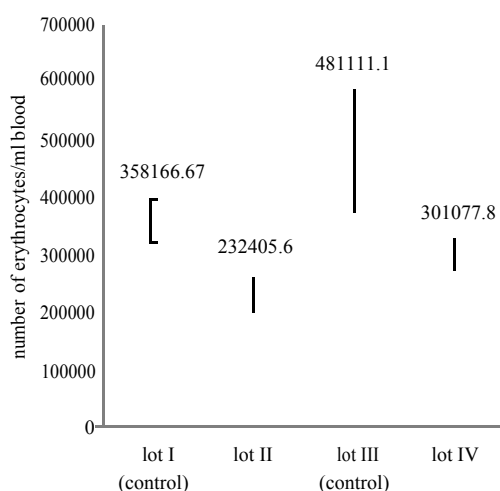


Figure 1. The influence of Actara 25WG insecticide upon number of erythrocytes in *Rana ridibunda*

Thus, in animals treated with Actara 25WG in a dose of 0.4mg/g body weight, there has been a decline in the number of erythrocytes with 35.11% to the control value for specimens kept

cold (4-6°C) and 37.42% for animals treated with insecticide to warm (22-24°C).

The number of leukocytes (Figure 2) at the two heat levels is similar to that of the number of red blood cells as can be seen in Figure 2. The number of leukocytes decreases by 28.52% to the witness for animals treated with Actara 25WG and kept cold (4-6°C), while the value of this index is lower at higher temperatures (22-24°C) 62.06% as compared to the witness.

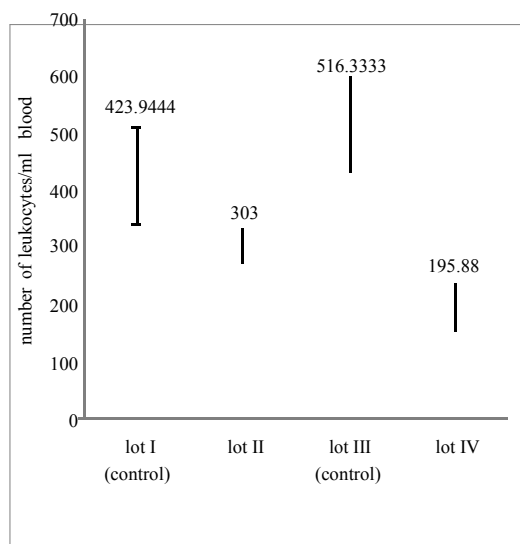


Figure 2. The influence of Actara 25WG insecticide upon number of leukocytes in *Rana ridibunda*

We mention that similar results in the number of erythrocytes in the lake frog were obtained by other researchers in similar experimental conditions in fish. Thus, Ponopal [6] found a decrease in the number of erythrocytes in fish under the action of Actara 25WG insecticide, as well as a decrease in the oxygen consumption. Dhembare [1] recorded decreased hemoglobin, the number of erythrocytes, leukocytes and platelets in fishes were exposed to LC50 of some insecticides for seven days.

The influence of Actara 25WG is also felt in the glucose level, whose values are shown in Figure 3. Its analysis shows an increase of glucose by 85.07% compared to witness for animals kept at a temperature of 4-6°C and treated with a concentration of 0.4mg/g Actara 25WG and 153.05% for the animals kept at 22-24°C and treated with the same concentration

of toxic. These changes occur due to inhibition of glucose tissue by the toxic, and inhibition of Krebs cycle and glicolise enzymes, this leading to accumulation of glucose in the blood. Increases in blood glucose levels were also obtained by Păunescu [3] in studies on *Rana ridibunda* treated with a concentration of 0.1ml/l Carbetox.

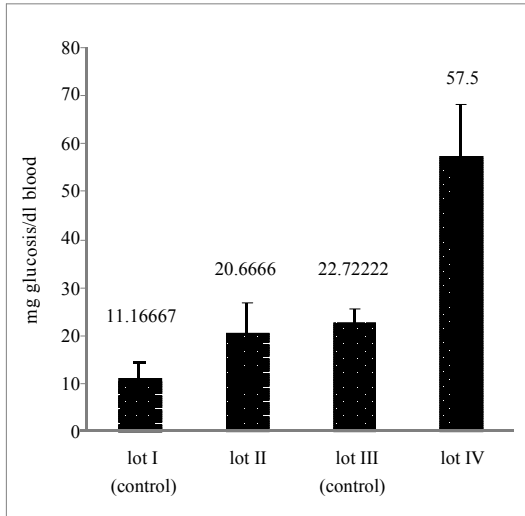


Figure 3. The influence of Actara 25WG insecticide upon glycaemia in *Rana ridibunda*

Actara in concentration of 0.4mg/g leads to lower cholesterol in animals kept cold (4-6°C) by 8.48% as to witness, for animals kept warm and treated with the same dose of toxic, lowering the value of this index by 12.63% as to the witness (Figure 4).

A decrease in cholesterol under the action of thiamethoxam was observed by Green [2] in studies on mice. They have also reported the accumulation of fats in liver (steatosis) accompanied by necrosis of hepatocytes. There are no significant changes in the value of triglycerides (figure 5) since animals were not fed during the experiment.

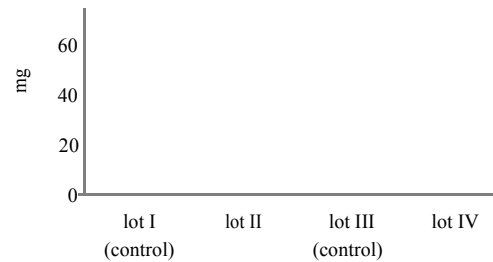
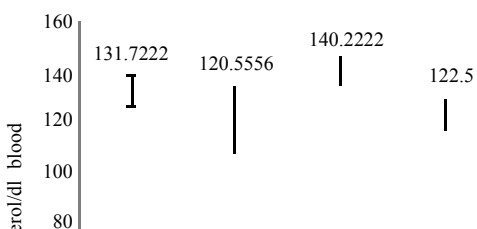


Figure 4. The influence of Actara 25WG insecticide upon cholesterol level in *Rana ridibunda*

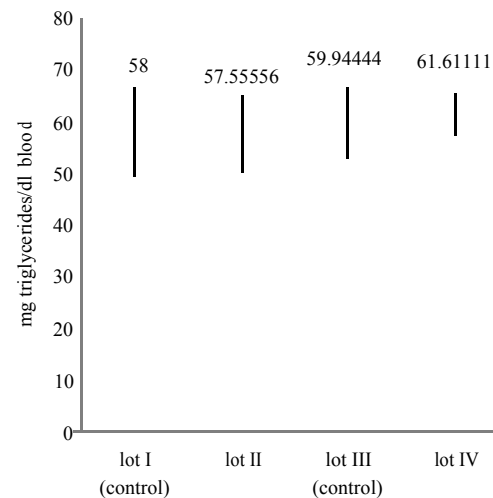


Figure 5. The influence of Actara 25WG insecticide upon triglycerides level in *Rana ridibunda*

Thus, in cold variant (4-6°C) Actara 25WG determinate a decrease in number of erythrocytes, leukocytes and cholesterol level and an increase a glycaemia. The triglycerides level remains unchanged. In warm variant (22-24°C) we noticed the same modification upon studies parameters but the toxic effect is more powerful.

4. CONCLUSIONS

Actara 25WG (major active ingredient is thiamethoxam 25%) in concentrations of 0.4mg/g body weight, had a significant effect upon number of RBC, WBC, glycaemia and cholesterol level, until the triglycerides level remain unchanged.

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