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RESEARCHES REGARDING THE CHANGES OF SOME PHYSIOLOGICAL PARAMETERS AT THE PRUSSIAN CARP (*Carassius auratus gibelio* Bloch 1782) UNDER THE ACTION OF THE DUAL GOLD 960 EC HERBICIDE

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Abstract
Herbicides are chemical substances with selective toxic action (limited for some vegetal species) or general (for any species), used to fight against weeds in the crops, fruit and grapes-growing fields, parks etc. The administration of herbicides though has complex effects on the biocenosis.
In the aquatic environment, they have proved to be toxic not only for the aimed plants, but also for numerous species of animals. The deterioration of the aquatic environment is accentuated by the fact that plants that had died due to the treatment decompose themselves in a rapid manner, leading to the decrease of the oxygen level in the water, the final consequence being the increase in the death rate of the animals.
This paper has studied the action of the Dual Gold 960 EC herbicide in different concentrations on some physiological indicators for the Prussian carp (Carassiusauratusgibelio Bloch 1782). The herbicide has had an inhibitive effect on the researched parameters for all the used concentrations.

Keywords: oxygen consumption, breathing rhythm, red blood cells, white cells, glycaemia

1. INTRODUCTION

Herbicides are chemical substances used to fight against weeds. Most of the herbicides used nowadays are considered organic herbicides and contain carbon, excepting the class that has arsenic as an active substance.

Herbicides can reach the aquatic environment or the soil voluntary and direct (through direct terrestrial or aerial use or through the use in the irrigation water) or in an indirect and involuntary manner (due to the derivation effect, leakages at the surface and in the depth, rains, falls from the slopes, industry leakages, through agricultural or animal waste, through volatilization).

From the toxicological perspective, most of the herbicides used in our country's agriculture are part of the 4th group, namely with a low toxicity degree.

Dual Gold 960 EC is an emulsifying concentrate that looks like a clear liquid, slightly sticky, homogenous, with a dark brown color. It contains 960 g/l s-metolachlor, are part of the acetanilides. Metolachlor is applied to the cultures before the easting of the plants from the soil and it is used to control certain annual herbs and weeds in the fields of corn, soya, peanuts, besom, potatoes, cotton,

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saffron, stone fruits and decorative wooden plants. It inhibits the synthesis of the proteins, thus influencing in a negative manner the rich protein crops (soya).

2. MATERIALS AND METHODS

In all the experimental variants, we used Prussian carp as test animals (Carassius auratus gibelio Bloch), a common species in the Arges Rives and the ponds around.

The acclimation of the fishes to the laboratory conditions has been made for 14 days in glass aquariums with a capacity of 100l, given the natural photoperiodicity. During the experiments, fishes were not fed to avoid the influence of feeding. Working concentrations were established after the passing through the literature and the making of the survival tests (for each experimental variant, we carried out the limit test, with 100 mg product/l water, as it is recommended by the toxicity tests used in the European Union). The temperature at which the experiments were made is 18-20 °C. The solutions in the aquarium were changed at 24 hours, the testing modality being the semi-static one.

The determination of the oxygen consumption was made through the Winkler method at 24, 48, 72, 96, 168 and 336 hours.

The determination of the breathing rhythm was made during the contention of the fishes to realize the Winkler method, we made successive determinations of this indicator using a chronometer, until we reached three close values (their average representing the breathing rhythm at that moment). The determination of the breathing rhythm was made at 24, 48, 72, 96, 168 and 336 hours.

The determination of the red blood cells and white cells were made using a Thoma numbering camera through the method described by Picos and Nastasescu (1988), from blood prelevated from the caudal artery.

The glycaemia, like the number of red blood cells and white cells, was determined after two weeks from the exposure to the toxic substance, the fishes being sacrificed after this period in order to realize the blood relations.

3. RESULTS AND DISCUSSIONS

The registered results where we pursued the action of the Dual Gold 960 EC herbicide with concentrations of 0,005 ml/l water and 0,020 ml/l water on the oxygen consumption, the breathing frequency and the number of red blood cells are displayed in the following figures.

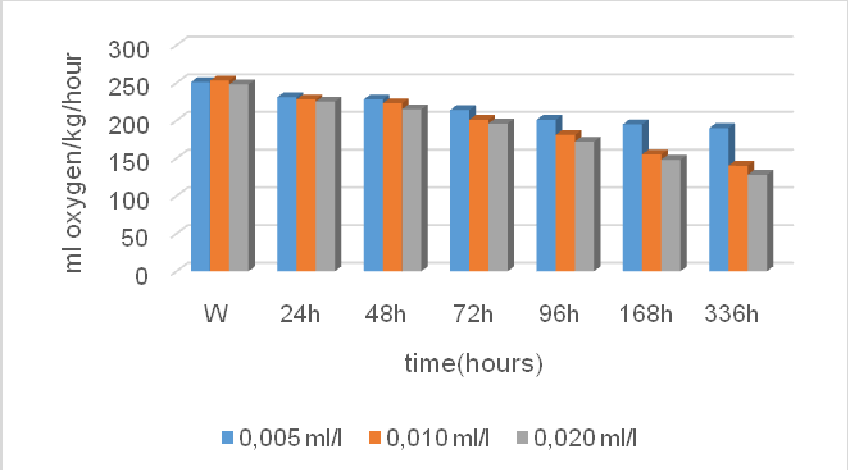

Figure 1. The influence of the Dual Gold 960 EC herbicide on the oxygen consumption for Prussian carp (Carassius auratus gibelio* Bloch*)

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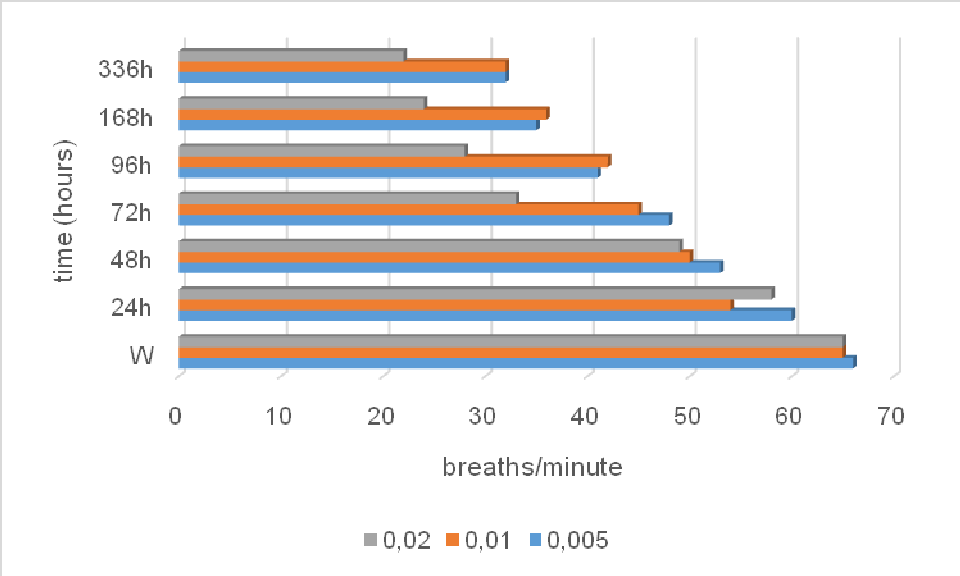

Figure 2. The influence of Dual Gold 960 EC herbicide on the breathing rhythm for the Prussian carp (Carassius auratus gibelio* Bloch*).

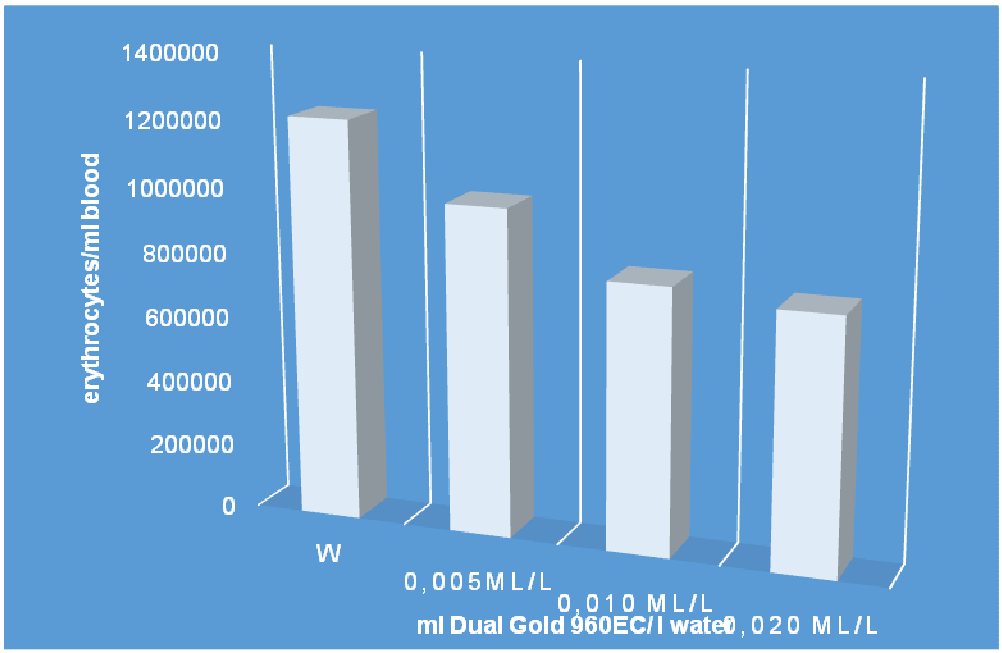

Figure 3. The number of erythrocytes (Carassius auratus gibelio* Bloch*) after 14 days of exposure

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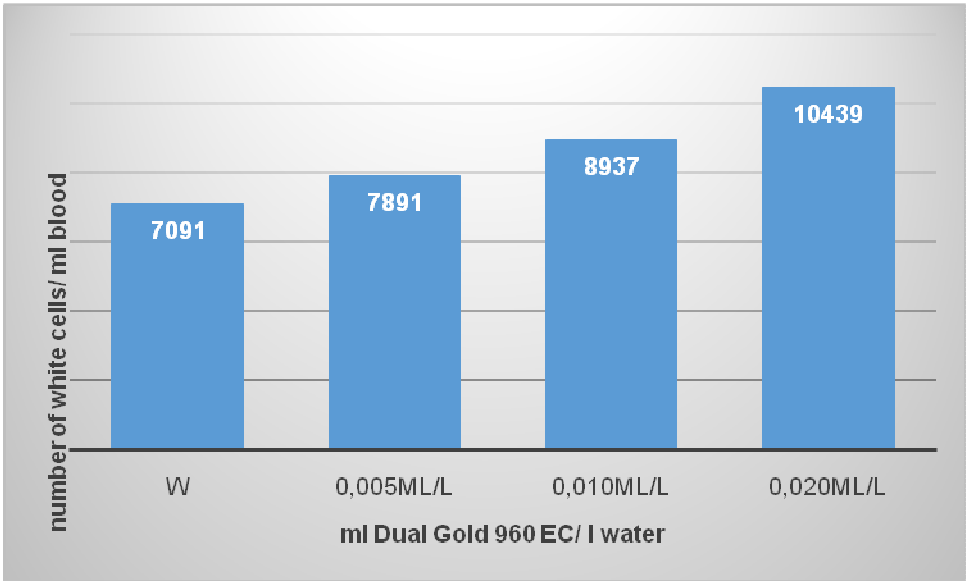

Figure 4. The action of Dual Gold 960 EC herbicide on the number of white cells for the Prussian carp (Carassius auratus gibelio* Bloch*)

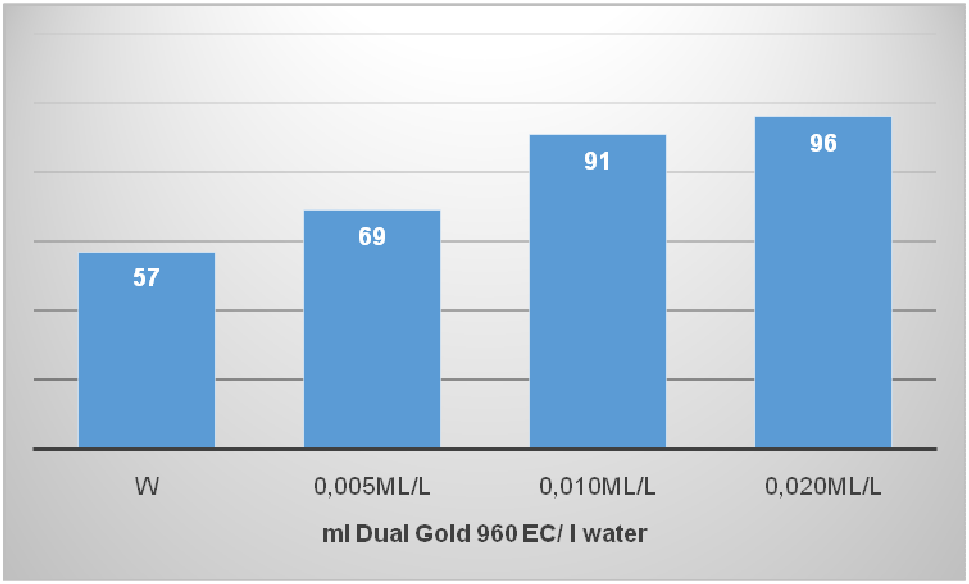

Figure 5. The action of the Dual Gold 960 EC herbicide in different concentrations on the glycaemia for the Prussian carp (Carassius auratus gibelio* Bloch*)

The oxygen consumption is a physiologic indicator used to establish the stress level of fishes. This indicator suffers significant changes for the fishes exposed to Dual Gold 960 EC herbicide in all used concentrations.

The variation of the oxygen consumption for the fishes that were exposed to the action of the Dual Gold 960 EC herbicide at the temperature of 18-20°C is displayed in figure 1. We notice that the

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Dual Gold 960 EC herbicide reduces the energetic metabolism of Carassius auratus gibelio. After 24 hours of toxic exposure, the oxygen consumption decreases between 7,96% and 9,88%. From the statistic interpretation of the results, we can see that the modifications of the oxygen consumption in the first 48 hours at the fishes that were exposed to the Dual Gold 960 EC herbicide at the concentration of 0,005 ml/l water are insignificant for the signification threshold of $p<0,05$. At the final of the acute test, we registered low values of this indicator compared to the values of the witness value (by approximately 19-30%), the herbicide manifesting an inhibitory action during the whole experiment.

The effect of Dual Gold 960 EC is inhibitory on the fishes' respiratory rhythm that was exposed to it. The decrease of the breathing rhythm is maximum after 14 days of contact with Dual Gold 960 EC herbicide at a concentration of 0,020 ml/l.

At 18-20°C, in all the variants we numbered the white cells, we noticed the decrease of this physiological parameter. The modified white cells of the fishes can be considered true cellular bio-sensors for the eco-toxicological study of the pollutants mixtures and can represent an ideal model of understanding the damaging action of pesticides at the level of different cellular compartments.

The decrease of the white cells can be the result of an unbalance between the haemato-creating processes and the haemolysis procedures, due to the toxic action, expressed through an increase of the red blood cells synthesis, or through an intensification of the haemolysis (Gabrien et al., 2009).

The decrease registered at 18-20°C was 18,47%, 33,76% and 36,80% for the experimental values of 0,005 ml Dual Gold 960 EC/l water, 0,010 ml Dual Gold 960 EC/l water and 0,020 ml Dual Gold 960 EC/l water.

In all experimental variants it was noticed an increase of the number of white blood cell, which was the result of stimulation of defense mechanisms by the toxic substance.

This increase was as follows: 11.28% at 0,005 ml concentration Dual Gold 960 EC / l of water, 26.03% at concentration of 0.010 ml Dual Gold 960 EC / l of water and 47.21% at concentration of 0.020 ml Dual Gold 960 EC / l of water.

The determination of the glycaemia was made using the Accutrend®GCT device, which allows the measuring of the glycaemia value in the blood drops.

The level of the glycaemia increases for all experimental values, the most significant increase of this indicator being registered at the concentration of 0,020 ml Dual Gold 960 EC/l water (68,42% compared to the witness sample).

The registered hyper-glycaemia is probably caused by the decrease of the sealant use of the glucose, due to the toxic action of Dual Gold 960 EC herbicide.

4. CONCLUSIONS

The Dual Gold 960 EC herbicide reduces the energetic metabolism of the *Carassius auratus gibelio* in all used concentrations, after 24 hour, the oxygen consumption decreases by 7,96-9,88%, and at the final of the acute test by 19-30%.

The effect of Dual Gold 960 EC herbicide is inhibitory to the breathing rhythm of the fishes, the decrease of the breathing rhythm reaching the maximum level after 14 days from the exposure to the herbicide.

In all the experimental variants, we noticed the decrease of the red blood cells, the most significant decrease being at the concentration of 0,020 ml Dual Gold 960 EC/l water.

Both the number of white cells and the level of the glycaemia registered a significant increase in all studied concentrations, the most significant increase being registered at the concentration of 0,020 ml Dual Gold 960 EC/l water.

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