Current Trends in Natural Sciences Vol. 4, Issue 8, pp. 126-133, 2015

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

STUDIES REGARDING THE INFLUENCE OF TOPSIN M 70 PU FUNGICIDE ON *CARASSIUS AURATUS GIBELIO* BLOCH L. 1758

Bogdan Mihai Udroiu*

*Stoeneşti School, Argeş County, Romania
E-mail: bogdanclg2007@yahoo.com

Abstract
The main objective of this study is to see how the metylthiophanate fungicide influences the energetic metabolism and the breathing rhythm at Carassius auratus gibelio Bloch L. 1758. Experimental samples were subjected to under-lethal concentrations of 3.75mg/l, 7.5mg/l, 15mg/l and 30mg/l methyl-thiophanate fungicide from 24 to 336 hours. The physiologic parameter with the highest growth rate was the oxygen consumption, which, at the concentration of 7.5mg/l grew by 40.3% in 6 hours, compared to the witness values, registering the value of 179.52 mg oxygen/l/h compared to 127.95 mg oxygen/l/h. Also, the breathing rhythm grew at the concentration of 7.5 mg/l by 24.76% in 6 hours, compared to the witness values. At the concentration of 30mg/l, both physiologic parameters decreased. So, after 6 hours, the oxygen consumption decrease up to 31.38% from the witness values, registering the value of 51.503mg oxygen/l/h compared to 164.09mg oxygen/l/h, and the breathing rhythm decreased to 84.3% compared to the witness martor.

Keywords: Carassius auratus gibelio, metylthiophanat, fungicide, lethal concentrations

1. INTRODUCTION

Through this paper, we proposed the study of Topsin M 70 PU fungicide on fishes, considering the *Carassius auratus gibelio* species. In this case, the polluting active substance which acts on the fishes' metabolism is the thiophanate-methyl.

There isn't much data regarding the toxic action of this fungicide on aquatic organisms, this is why the present paper represents a significant contribution regarding the influence of thiophanate-methyl on some aquatic organisms. Considering the large scale pollution of many categories of surface waters (rivers, lakes), and also of some underground waters (water tables) with insecticides, fungicides, herbicides, and other substances used on large scale in the intensive agriculture, which accidentally reached the aquatic environment, this paper proposed the determination of the value of the impact of this fungicide type on *Carassius auratus gibelio*, including it on a wider trend, whose objective is the analysis of the human impact generated by the pollution with substances used in the agriculture on the aquatic phenomenon.

2. MATERIALS AND METHODS

Originating in Oriental Asia, China and Japan (http://bmcevolbiol.biomedcentral.com/articles), the *Carassius auratus gibelio* is present in our country in nearly all the aquatic basins, the body is well proportioned, covered in relatively large and thick cycloid scales. The color of the body is influenced by the environment and seasonal conditions (Cotrău, 1978; Marinescu et al., 2004).

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

It is frequently met in standing waters, in the flowing ones with low speed or in the arms of some rivers and very frequently in the systemic fishing basins.
The used methods were: the determination of the oxygen soluted in water (the Winkler method) (Ionescu et al., 1988; Picoş et al., 1988); the determination of the oxygen consumption of the fishes through the method of the closed breathing room (the method of the confined space) (Marinescu et al., 2000, www.devb.gov.hk/filemanager).
Preliminary works to the experience:
- the acclimazation (the physiological adaptation) of the fishes to the respective temperature:
- the interruption of the feeding;
- The habituation of the fishes to their introduction in the breathing room and with their staying in its limited space.
The experimental protocol:

1. All the determinations were made under a strict surveillance, following the avoidance of possible influences of the factors irrespective of the followed objective. Rich organic materials water was avoided.
2. Experiences were carried out at a temperature of 17-20˚C (this temperature was maintained during the whole experiment).
3. The illumination was between 8 and 12 hours, and the fishes were fed twice a week in the tanks.
4. The acclimatization of the fishes in the laboratory lasted 10 days, the death rate being 2%. Given these conditions, the sample was accepted.
5. The individuals that were introduced in the experiment were chosen considering strict criteria (fished that did not display external signs of illness and visible malformations).
6. High attention was paid to the manipulation of the fishes before the experiments. All determinations were made under the surveillance of the person making the experiments, separately taking notes for each test, regarding the spontaneous activity of the individuals in that experiment.
7. We exclusively considered the values for the fishes that, during the experiment, manifested a spontaneous activity that could be exteriorized (Marinescu et al., 2004).

Experimental variants:
Following the 10 days acclimatization in the laboratory, the fishes were divided in the following experimental variants:
Variant 1 – includes 10 fishes under the toxic action of thiophanate-methyl with a concentration of 3.75 mg/l.
Variant 2 - includes 10 fishes under the toxic action of thiophanate-methyl with a concentration of 7.5 mg/l.
Variant 3 - includes 10 fishes under the toxic action of thiophanate-methyl with a concentration of 15 mg/l.
Variant 4 - includes 10 fishes under the toxic action of thiophanate-methyl with a concentration of 30 mg/l.

3. RESULTS AND DISCUSSIONS

The results reached in the 4 experimental variants are discussed in the following graphics. From the values of the oxygen consumption reached in the experimental variant number 1 (thiophanate-methyl, 3.75 mg/l concentration) finds an inhibitory effect on the oxygen consumption (Fig. 1) in the first 6 hours, representing 84.6% of the witness value.

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

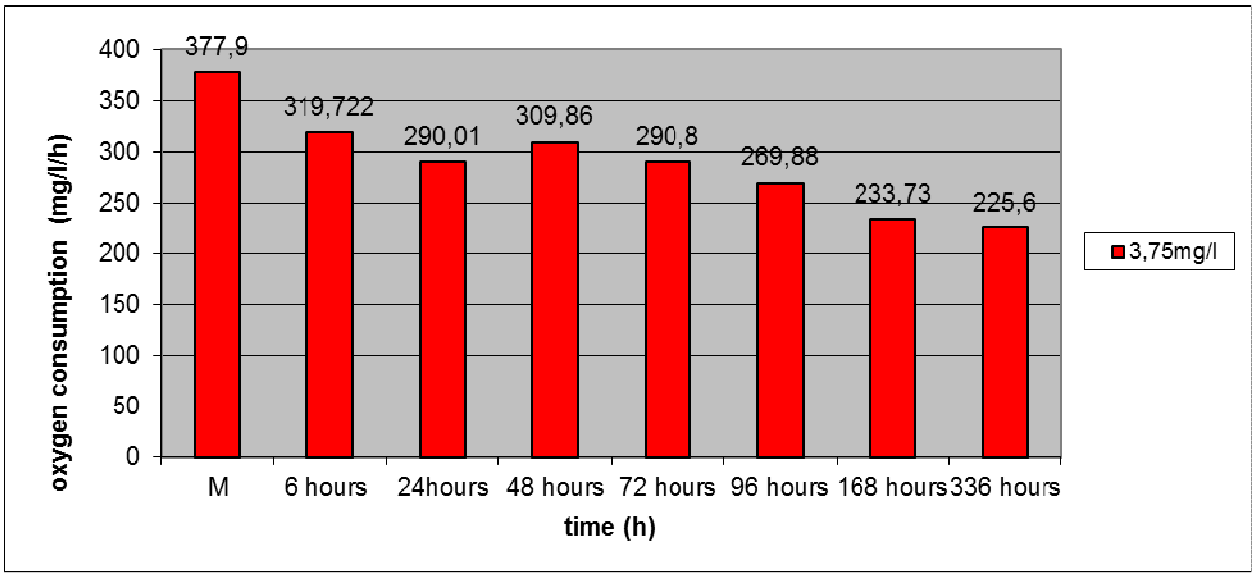

Figure 1. Action of the thiophanate-methyl fungicide, 3.75 mg/l concentration, on the oxygen consumption for Carassius auratus gibelio

After 24 hours, the reduction of the breathing consumption is maintained, and after 48 hours, we notice a slightly stimulating effect, followed by a continuous decrease from the 3rd to the 14th day, where the value of the oxygen consumption is 59.69% of the witness value.
In the experimental variant number 2 (thiophanate-methyl, 7.5 mg/l concentration), we notice (Fig. 2) a stimulating effect on the oxygen consumption in the first 6 hours, with a 40.3% increase; for 24 and 48 hours, a slight decrease of the oxygen consumption is reported, and for 72 and 96 hours, there is a significant decrease of 55.8% of the witness value, followed by an increase to the witness value.

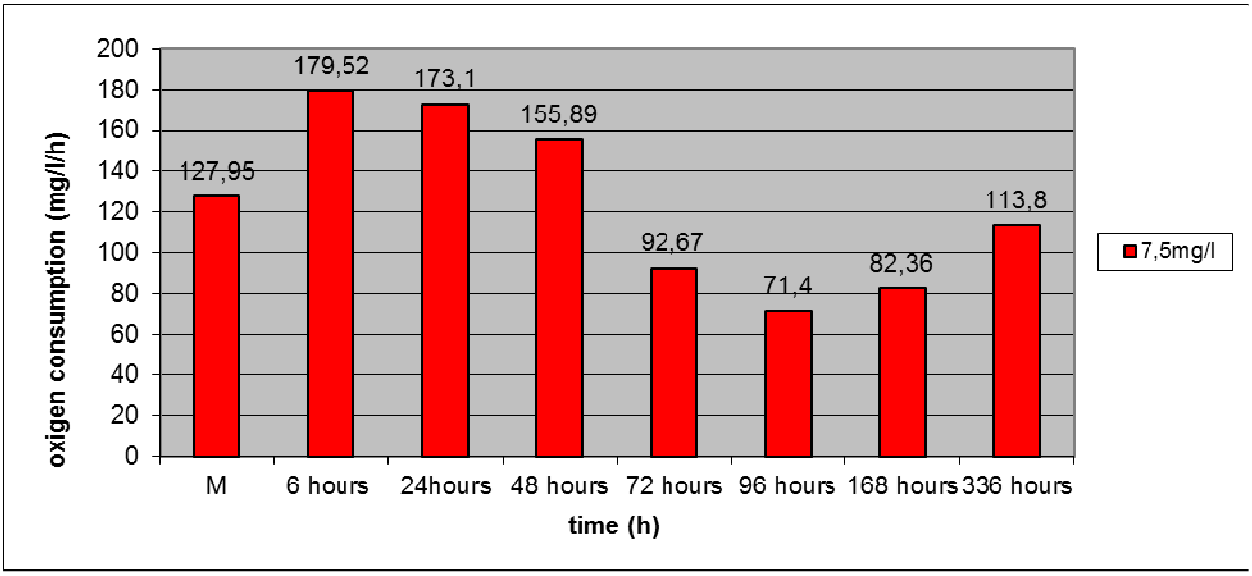

Figure 2. Action of the thiophanate-methyl fungicide, 7.5 mg/l concentration, on the oxygen consumption for Carassius auratus gibelio

In the experimental variant number 3 (thiophanate-methyl, 15 mg/l concentration), we findsa slight decrease of the oxygen consumption at 6 hours, followed by a significant increase of 54% at 24

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

hours compared to the witness value, increase which is also maintained at 48 hours. After 3 days, we notice a decrease of the oxygen consumption to the witness value, followed by a significant decrease and a significant increase, followed by a significant decrease (Fig. 3).

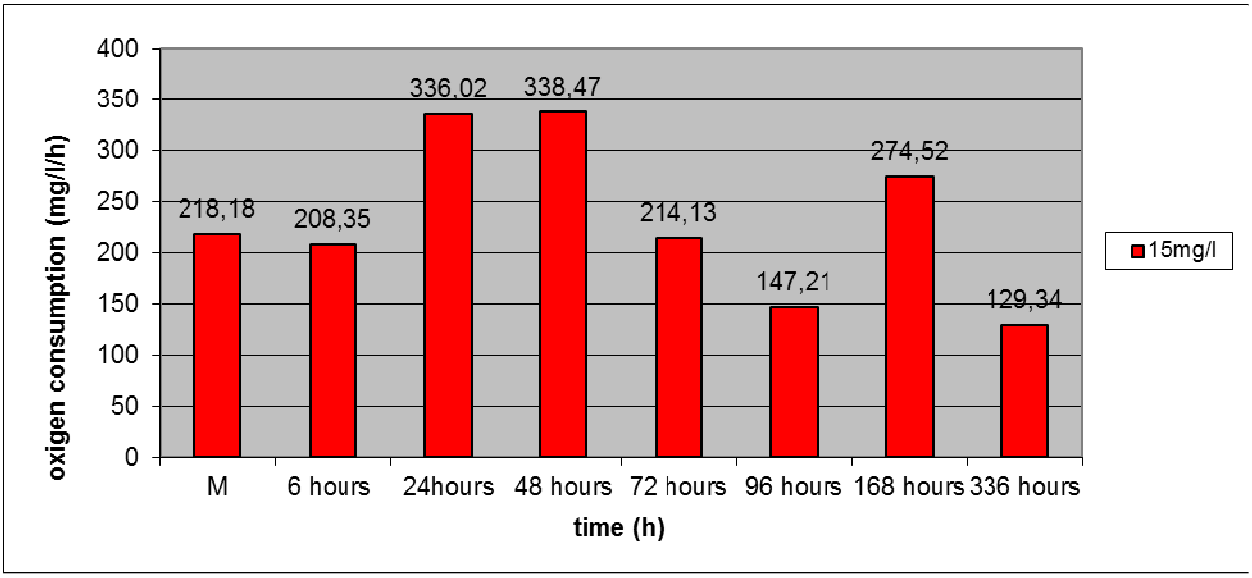

Figure 3. Action of thiophanate-methyl fungicide, 15 mg/l concentration, on the oxygen consumption for Carassius auratus gibelio

In the experimental variant number 4 (thiophanate-methyl, 30 mg/l concentration), the results show a sudden decrease of the oxygen consumption at the concentration of 30 mg/l of thiophanate-methyl, which is very toxic (Fig. 4). In this variant, the intoxication phases happen almost immediately after the exposure. For the individuals that survived for 6 hours, the oxygen consumption decreased to 31.38% of the witness value.

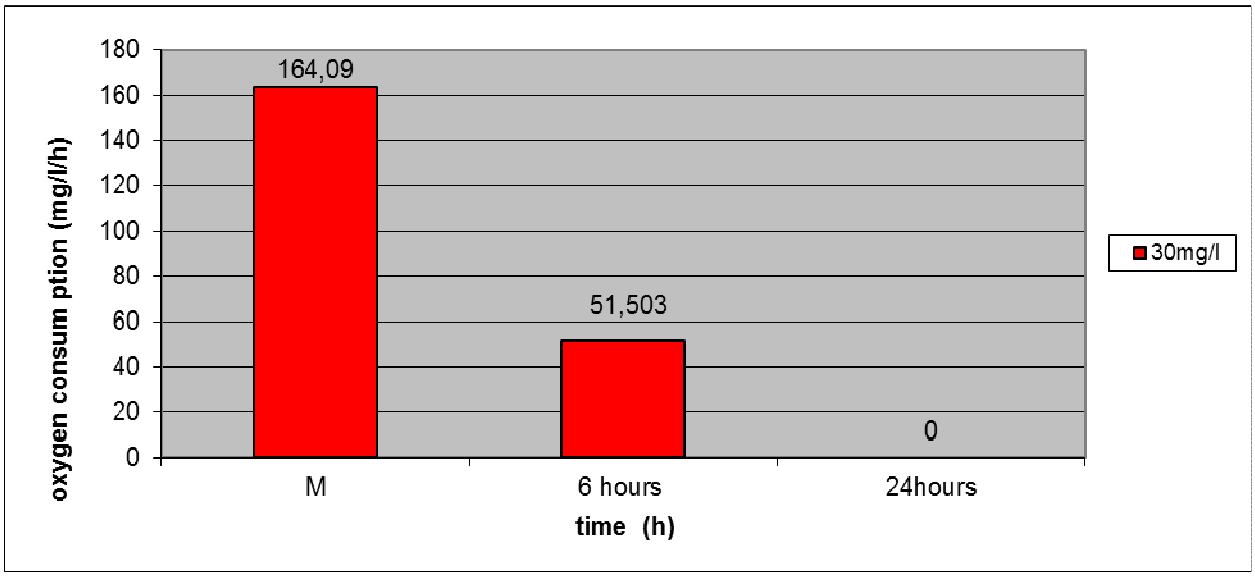

Figure 4. Action of thiophanate-methyl fungicide, 30 mg/l concentration, on the oxygen consumption for Carassius auratus gibelio

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

Comparative average values in terms of oxygen consumption in the first three experiments are shown below (Fig. 5).

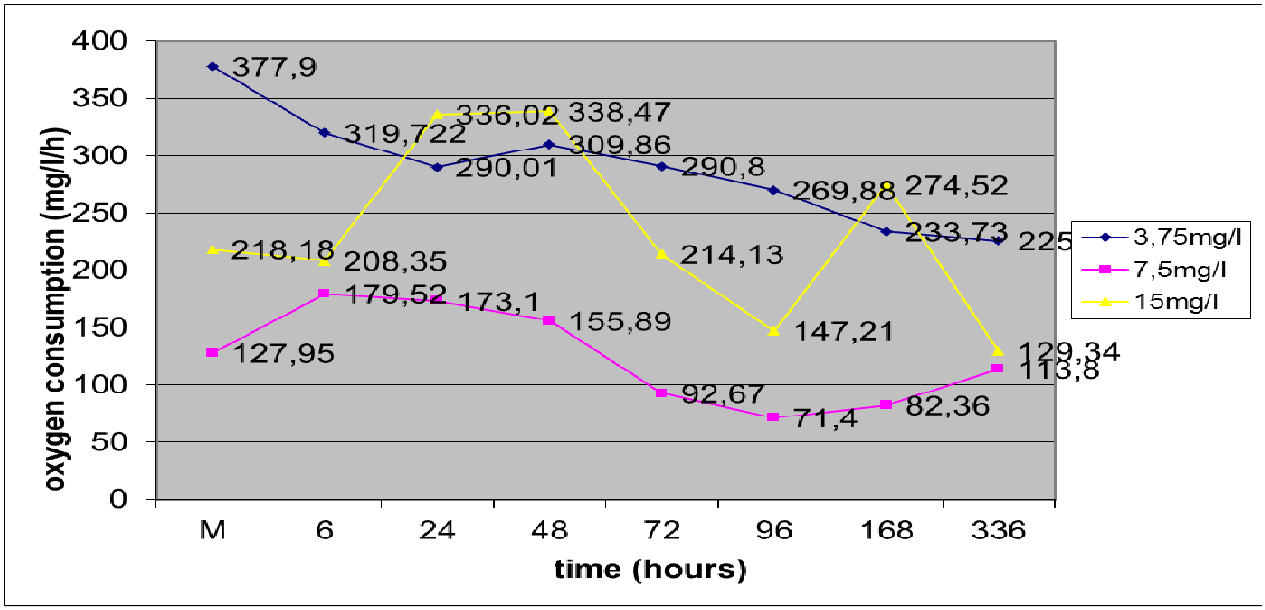

Figure 5. Average comparative values of the oxygen consumption reached in the first three experimental variants

Analyzing the second physiologic parameter (the breathing rhythm), we can see the following effect of the studied fungicide: at the concentration of 3.75 mg/l, in the first stage, the breathing rhythm increases by 18.03% of the initial value, increase which is maintained for the periods of 24 and 48 hours. After this interval, we notice a decrease of the index, after 7 days, the breathing rhythm decreases to 3.38% of the witness value, and after 14 days, the breathing rhythm has a value which is very close to the witness value (Fig .6).

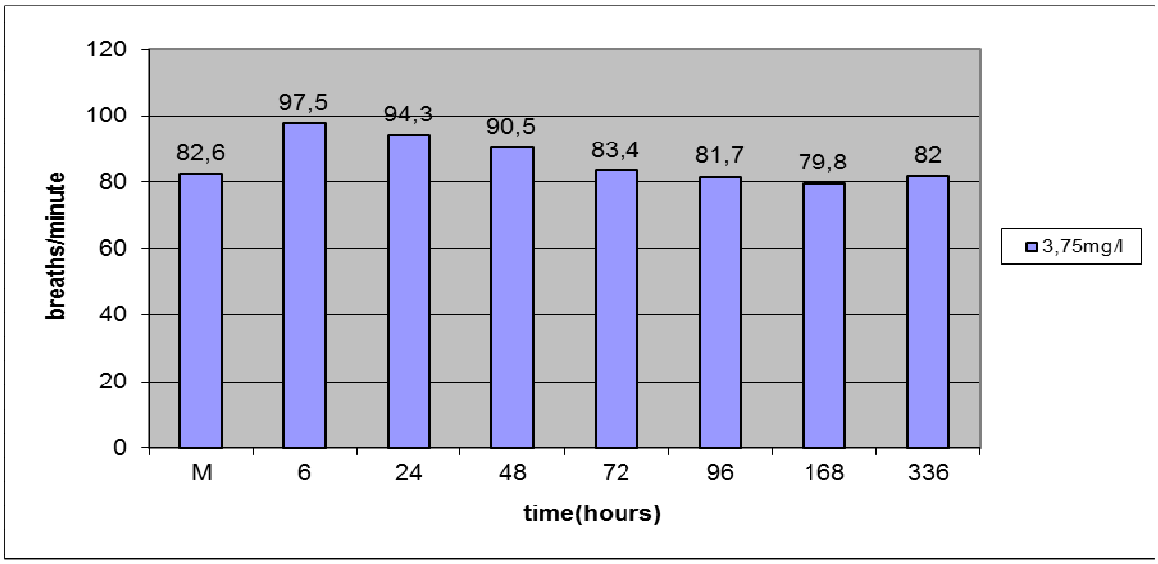

Figure 6. Breathing rhythm for Carassius auratus gibelio on 3.75 mg/l concentration of thiophanate-methyl fungicide

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

At a concentration of 7.5 mg/l, the breathing rhythm increases by 24.76% of the witness value at 6 hours. The increase of the breathing rhythm is also maintained for 24 and 48 hours, and at 96 hours, we notice a 14.15% decrease of the breathing rhythm, which is maintained until the 14th day of the experiment (Fig. 7).

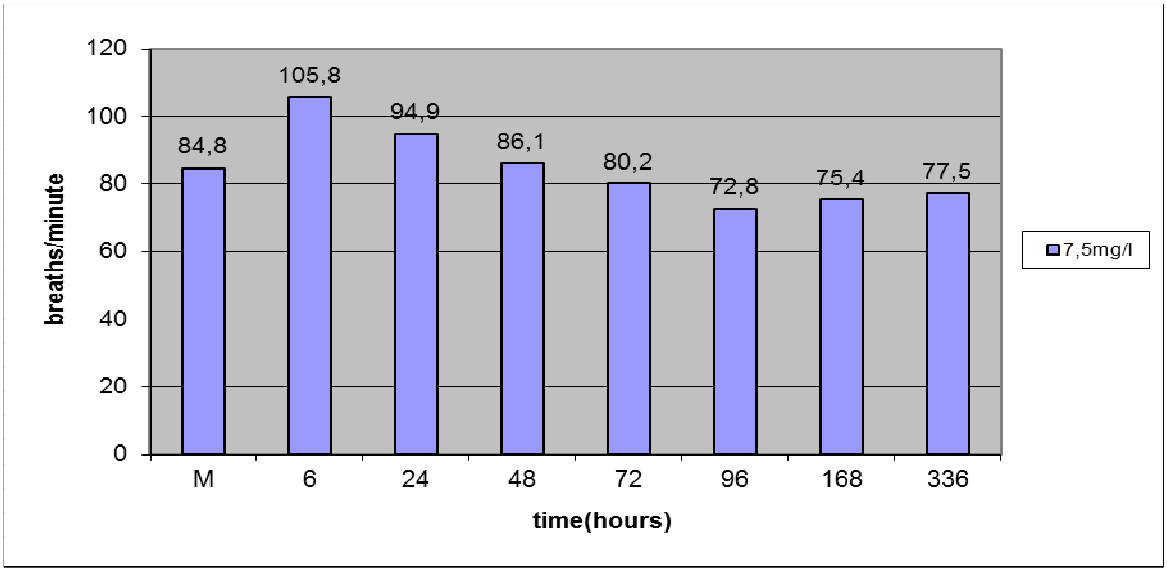

Figure 7. Breathing rhythm for Carassius auratus gibelio on 7.5 mg/l concentration of thiophanate-methyl fungicide

At a concentration of 15 mg/l of thiofanate methyl fungicide, the breathing rhythm (Fig.8) increases to 13.95% in the first 6 hours compared to the witness value, followedby a sudden decrease of the breathing rhythm of 24.5% of the reported value for 6 hours and a 13.95% decrease from the witness value. Moreover, we register a decrease of the breathing rhythm for 48, 72 and 96 hours and at 168 hours we register a sudden decrease of the breathing rhythm 55.44% compared to the witness value and a 70.03% decrease at 336 hours reported to the witness value.

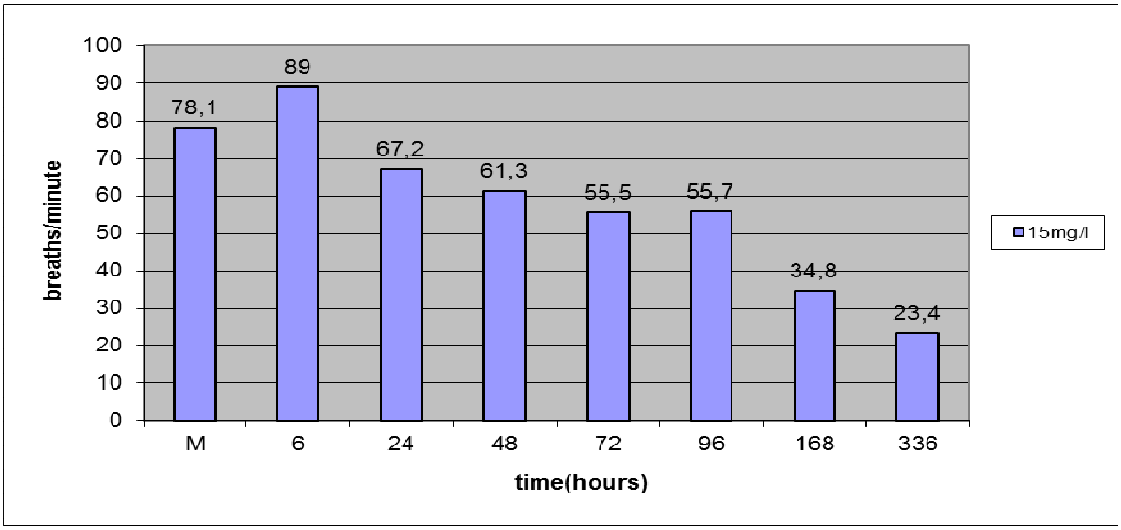

Figure 8. Breathing rhythm for Carassius auratus gibelio on 15 mg/l concentration of thiophanate-methyl fungicide

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

When the concentration of thiophanate-methyl was 30 mg/l, after 6 hours, the breathing frequency has suddenly fallen by 84,3% compared to the witness value, and after 24 hours, all the fishes died, with the fungicide having a very toxic effect on the fishes at this concentration (Fig. 9).

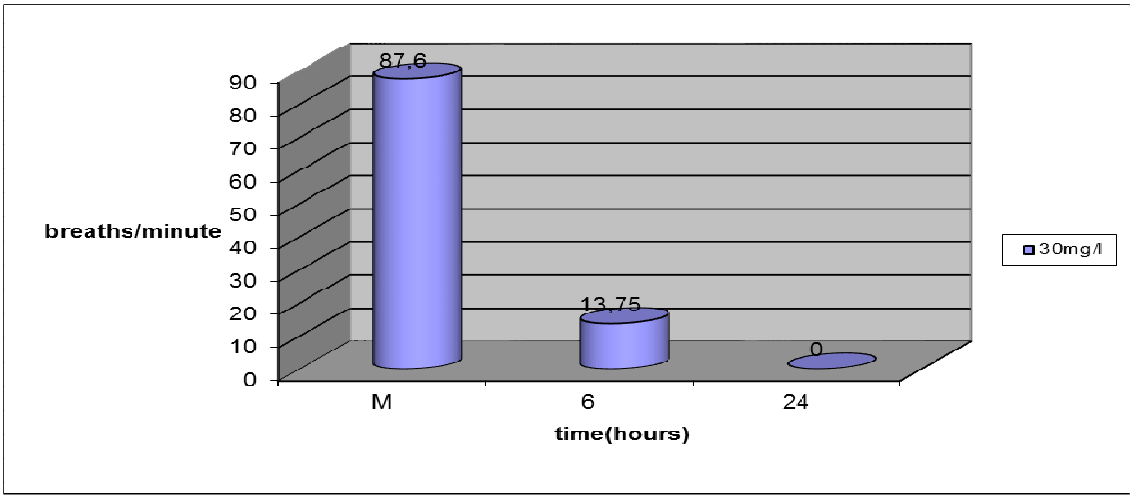

Figure 9. Breathing rhythm for Carassius auratus gibelio on 30 mg/l concentration of thiophanate-methyl fungicide

From figure 10, we can see that the breathing rhythm increases for small and intermediary doses, and then decreases, especially at the 15 mg/l dose. For the highest dose, we register a sudden decrease of the breathing rhythm in the first 6 hours, and after 24 hours, all the fishes are dead.

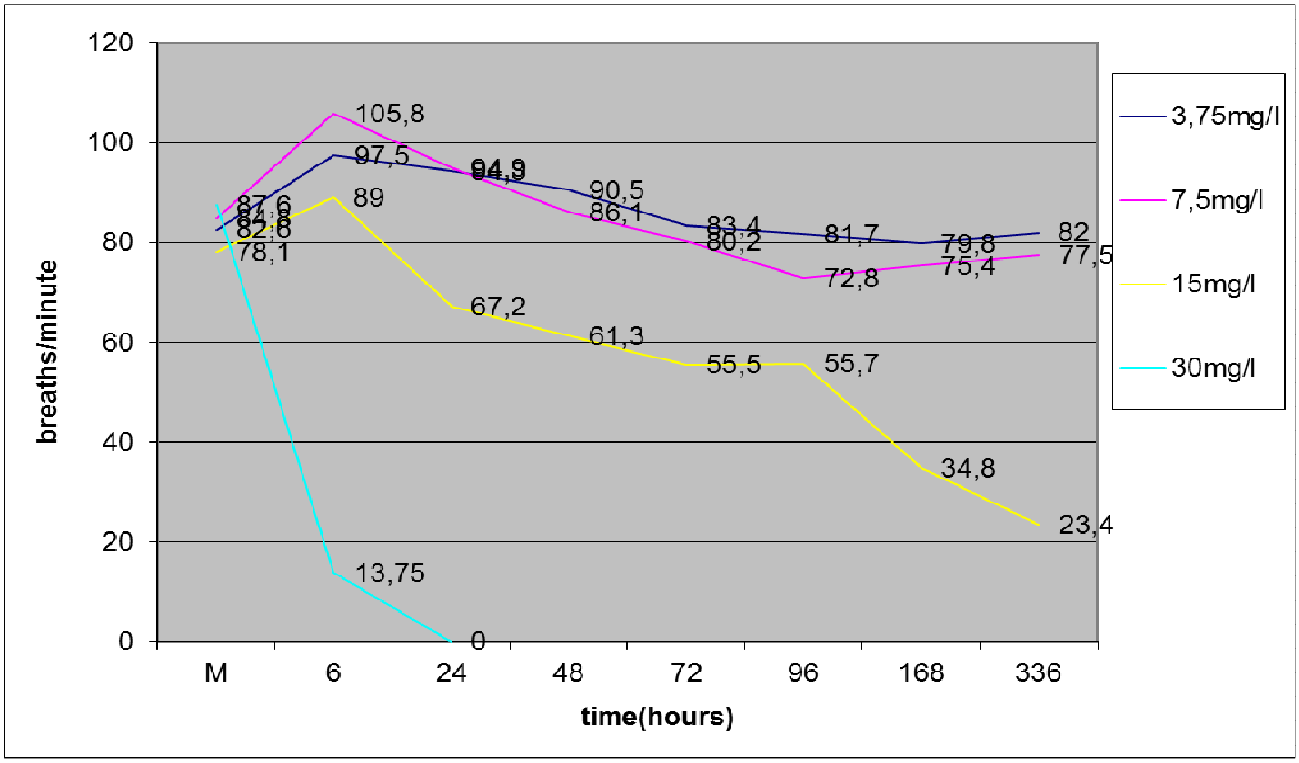

Figure 10. Average comparative values of the breathing rhythm reached in the 4 experimental variants

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

4. CONCLUSIONS

For all the researched concentrations, the thiophanate-methyl has modified the values of the breathing rhythm for the *Carassius auratus gibelio*. For the first 3 concentrations, the effect of the fungicide is a stimulant in the beginning and then an inhibitor of the breathing movements' frequency.

For the first 2 concentrations, we notice a reestablishment of the breathing rhythm through a slight increase.

In the case of 15mg/l thiophanate-methyl concentration, we notice an initial increase of the breathing rhythm, followed by a sudden decrease which is maintained until the end of the testing period.

For the 30mg/l concentration, the effect of thiophanate-methyl on the breathing rhythm was strongly inhibitory, the registered values at the end of the experiment being significantly different compared to the witness value.

In the case of variants 1 and 3, the fungicide had an inhibitory effect on the oxygen consumption for the *Carassius auratus gibelio* at 6 hours. At the concentration of 3.75mg/l of thiophanate-methyl, we notice a slightly stimulating effect, followed by an inhibitory one until the end of the experiment. At the concentration of 7.5mg/l of thiophanate-methyl, we notice a strong stimulating effect of the oxygen consumption for 24, 48, and 168 hours and a strongly inhibitory effect for 96 and 336 hours.

In the case of variant 2, the fungicide had a stimulating effect in the first 6 hours, followed by an inhibitory effect after 4 days and then a stimulating effect of reestablishing the value close to the witness value.

At the maximum concentration of thiophanate-methyl, of 30mg/l, the death rate of the *Carassius auratus gibelio* is 100%, in less than 24 hours.

5. REFERENCES

Cotrău, M. (1978). Toxicologie, principii generale. Editura Junimea, Iași.

Dindea, M. (1986). Toxicologie acvatică, Editura Dacia, București.

Ionescu, M., Cușa, V. (1988). Îndrumător metodologic de toxicologie acvatică. Institutul de cercetări şi proiectări pentru gospodărirea apelor-STAS, Cluj Napoca.

Marinescu, Al. G., Ardelean, A., Kunneman, H. Krebs, Brezeanu, F., Drăghici, O., Ponepal, C., Păunescu, A., Mitu, L., Sasu, L. (2004). Testarea ecotoxicității asupra peștilor. Primul Simpozion Național de Ichtiologie "Starea actuală a ichtiofaunei României", Arad.

Marinescu, Al. G. (2000). Fiziologia metabolismului animal. Tipografia Universității din Pitești.

Picoş, C., Năstăsescu, G. (1988). Practical works on the animal physiology. Printing House of the University of Bucharest.

http://bmcevolbiol.biomedcentral.com/articles

www.devb.gov.hk/filemanager