

## STUDY REGARDING THE LIGHT INFLUENCES ON EMBRYO DEVELOPMENT IN CARP (*CYPRINUS CARPIO*)

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**Abstract:** *The cyprinids embryo development biology is well-known in many countries of the world, but in Romanian speciality literature there are relatively few references to this. Also there is little information regarding the embryo development environment and especially the way in which certain environment factors influence the embryogenesis of the cyprinids. Several studies have shown that the light is for a majority of the fish species a negative factor - the increasing of the light intensity induced the multiplication of abnormal development and even the inhibition of embryo evolution. At a series of fish, whose spawn grows in luminosity natural conditions, the increasing of the light intensity induced a sizeable acceleration of embryos development. The aim of this paper is to emphasize the main aspects of the ways in which light influences the development of carp (*Cyprinus carpio*) embryos. During the experiments, 3 variants with natural light (variable control), continuous light and total darkness were used to monitor the development of carp embryos in 80x15 mm Petri dishes at an optimal density (1 embryo/ 3 ml) and at a 24°C temperature. We wanted to observe the morphological aspect of the embryos and to establish the embryonic stage in which they are at one point, in order to determine the possible aspect changes, the possible asynchronic development between the variants. It could be noticed that, in carp embryos, the incubation time in all three variants was of 72 hours for 60-100% of the embryos. However in total darkness, 10% of the embryos doubled their hatching period and 144 hours after the fertilization they died inside the corion. In continuous light the embryos hatched faster than in natural light. At the end of the experiment the hatching rate was of 100% in these two variants and of 90% in the third variant. The development of carp embryos is directly influenced by darkness, the period of hatching being the most sensitive period. Statistically, there are no differences between the control variant and the other two variants.*

**Key word:** *carp, embryo development, light*

### INTRODUCTION

The cyprinids embryo development biology is well-known in many countries of the world, but in Romanian speciality literature there are relatively few references to this. Also there is little information regarding the embryo development environment and especially the way in which certain environment factors influence the embryogenesis of the cyprinids.

Several studies have shown that, for most fish species, the light is a negative factor - the increasing of the light intensity induced the multiplication of abnormal development and even the inhibition of embryo evolution.

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The aim of this paper is to emphasize the main aspects of the ways in which light influences the development of carp (*Cyprinus carpio*) embryos.

### MATERIAL AND METHODS

Three experiment variants were prepared for during the experiment:

- variant 1 (V1) representing the witness sample, where the light intensity differed as follows: at 8 a.m. 10 lux, at 11 a.m. 18 lux; at 14 p.m. 20 lux; at 18 p.m. 13 lux; at 20 p.m. 5 lux (natural light);

- variant 2 (V2) represents the sample undergoing continuous luminance. The light source consisted in a neon lamp of 40 watt, with a constant light intensity of 36 lux/ 24 hours;

- variant 3 (V3) represents the sample which was kept permanently in the dark, during the entire incubation period.

The carp roe were introduced in Perti dishes of 80x15 mm, at an optimum density of 1 embryo/3 ml and an optimal temperature of 24 °C.

For each variant 3 repetitions were undertaken, so that, a total of 30 embryo was studied in each variant.

The fertilized carp roe were obtained from clinically healthy breeders, in the breeding season April-May 2008, through artificial fertilization (the dry method), at the CEFA fishery (SC ProAcva SA Cefa, Cefa, Bihor county).

We intended the observation of the embryos' morphological aspect and the establishment of the embryo stage at one point, in order to determine eventual aspect developments or a development asynchrony.

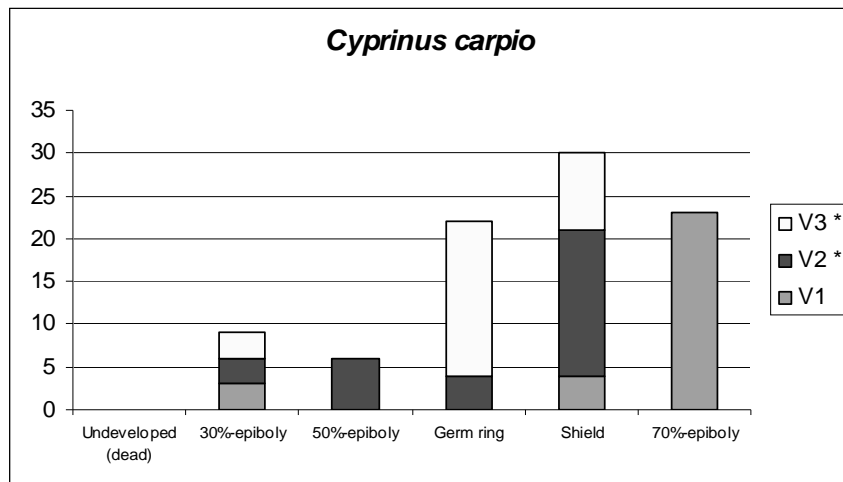
The observations were carried out under the OLYMPUS laboratory optic microscope.

At the end of the experiment, the hatching rate was calculated as the percentage of young larvae from the total incubated roe.

For the statistic processing of the experimental data, the non-parameter concordance  $\chi^2$  test was used.

## RESULTS AND DISCUSSIONS

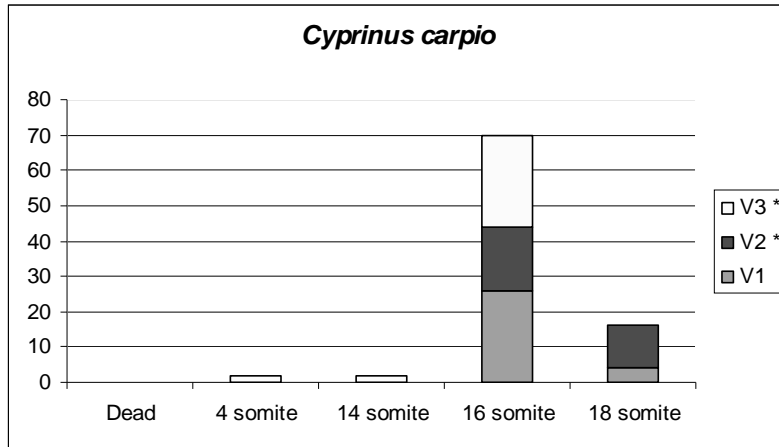
Graphs were used for a more suggestive presentation of the data (graphics 1-4).



Graph 1: Light influence upon embryo development in *Cyprinus carpio*, 10 hours from fertilization (\* p>0,05)

Ten hours from fertilization (graph 1), most embryos are in the gastrula period (90%, with all variants), and with the first variant 76.7% of the embryos are the most advanced around this time, namely in the 70% epiboly stage. No variant presents underdeveloped or

dead embryos. According to the statistic analysis, there are no differences between the witness variant and the other two variants ( $p > 0.05$ ), a situation present throughout the experiment.

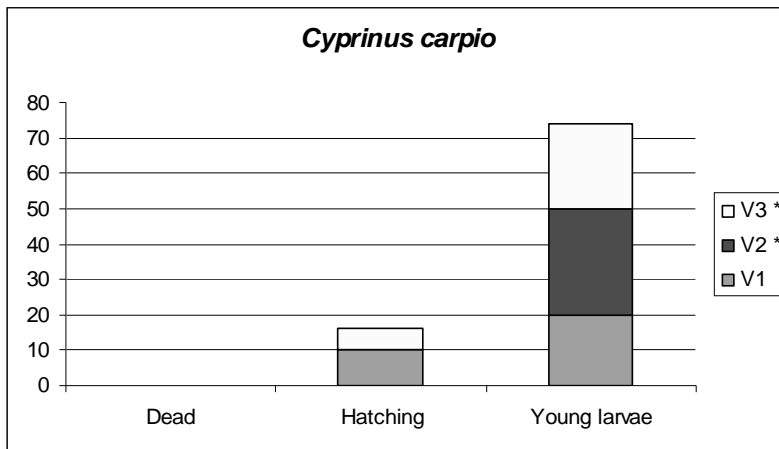


Graph 2: Light influence upon embryo development in *Cyprinus carpio*, 24 hours from fertilization (\*  $p > 0.05$ )

24 hours from fertilization (graph 2), embryos are in the segmentation period. We can observe a slight delay of 13.7% in V3, where the embryos are in a more incipient stage of the segmentation.

During the next observation hours, the embryos go through the different segmentation stages, so that 38 hours from incubation 80-100% are in the 30-40 somite stage.

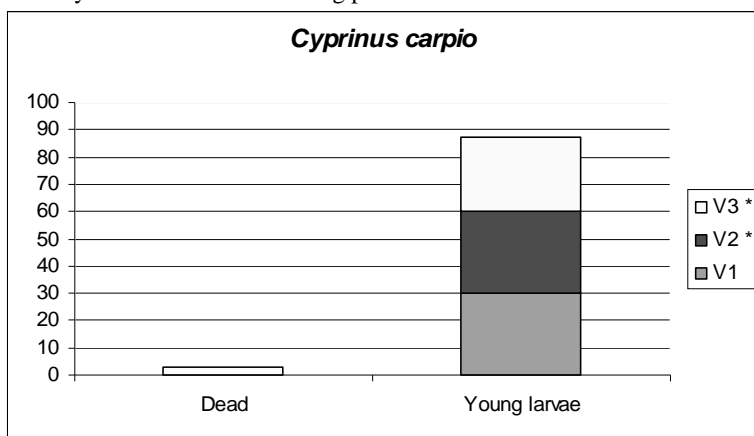
After another 10 hours of monitoring, all embryos, in all variants, are in the pharyngula period, after 48 from incubation, with pigmented eyes and body (100%), and after 60 hours they reach the hatching period.



Graph 3: Light influence upon embryo development in *Cyprinus carpio*, 75 hours from fertilization (\*  $p > 0.05$ )

Graph 3 shows the percentages after 75 hours from fertilization. As we can see, the embryos have hatched, they have reached the stage of young larvae. With the V2 variant with continuous light, all embryos have hatched (100%), with V1 almost 70%, and with V3 80%.

83 hours from fertilization, we have 100% young larvae with V1 as well, and with V3 10% of the embryos are still in the hatching phase.



Graph 4: Light influence upon embryo development in *Cyprinus carpio*, at the end of the experiment (\* p>0,05)

The data presented in graph 4 indicate the fact that 144 hours from fertilization, this representing the last reading to be carried out during the experiment, we could establish that the mortality rate with V<sub>3</sub> was of 10%, that is the embryos experienced a hatching period of over 60 hours, which resulted in no hatching and thus the death of the embryos inside the corion. According to the statistic analysis, there are no differences between the control variant and the other two variants (p>0.05).

### CONCLUSIONS

We could conclude that, in carp embryos, the incubation period in all three variants was of 72 hours for 60-100% of the embryos. Yet, in total darkness, 10% of the embryos doubled their hatching period, but with lethal effects.

In continuous light, the embryos hatched earlier than in natural light. At the end of the experiment, in these two variants, the hatching rate was of 100%, and in the third variant, it was of 90%.

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