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COMPARATIVE STUDY ON THE ACTIVITY OF MUSCULAR CATALASE IN SOME CULTURE CYPRINIDES

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***Key words**: Aristichthys nobilis, Hypophthalmichthys molitrix, aquaculture, catalase*

INTRODUCTION

Considering that fish represents a nutrient possessing a high dietetic and nutritive value, the studies devoted to some of its biochemical and physiological parameters have aroused on increasing interest from the specialists' part.

Under conditions of artificial feeding of the fish grown in ponds, lakes and accumulation dams, substitution of the natural food with artificial products may cause more or less beneficial modifications on the substances' metabolism. The intensity of such modifications may be evidenced by the evaluation of the different biochemical parameters from blood, muscle, digestive tube, liver etc. (VASILE *et al*., 2005 b).

Catalase (H_2O_2: H_2O_2 - oxidoreductase), a bicomponent enzyme belonging to the class of oxidoreductase, with hemine or ferriporphyrine IX as a prosthetic group, is largely occurring in almost all cells of the animals tissues, in both invertebrates and vertebrates (COJOCARU, 1997).

The studies devoted to catalase, an adaptation enzyme in fish, showed that its activity varies as a function of temperature, high density of the batches, quality of the administrated food, age of the individuals and organ taken into analysis (BATTES *et al*., 1974 - 1975; ARTENIE, 1990; VASILE *et al*., 2005 a).

The researches developed on catalase, as well as on other breathing and digestive enzymes playing an important part in metabolism, may provide some precious indications, permitting an as exact as possible evaluation of fish' physiological condition, as well as the application of the most efficient methods of intensive growth, for a rational and complex turning to good account of the existing accumulation dams through aquaculture.

MATERIAL AND METHOD

For the experiments, samples of muscular tissue have been taken over from 40, two year - old individuals belonging to the *Aristichthys nobilis* (bighead cap) and *Hypophthalmichthys molitrix* (silver carp) species from the accumulation dam of Ezăreni, the district of Jassy.

The activity of muscular catalase was determined titrimetrically, with potassium permanganate, by dosing of the oxygenated water remained undecomposed after interruption of enzyme's action upon it (COJOCARU, 2005).

For each of the analyzed samples, 3 parallel determinations have been made, the results obtained, processed statistically, being expressed as mg H_2O_2 / g / min.

RESULTS AND DISCUSSIONS

In *Aristichthys nobilis*, the activity of muscular catalase evidences an intense inter-individual variability, the highest value (44.656 mg H_2O_2 / g / min.) being recorded with individual number 5, while the minimum one (37.5 mg H_2O_2 / g / min.) - in number 17 (Fig. 1).

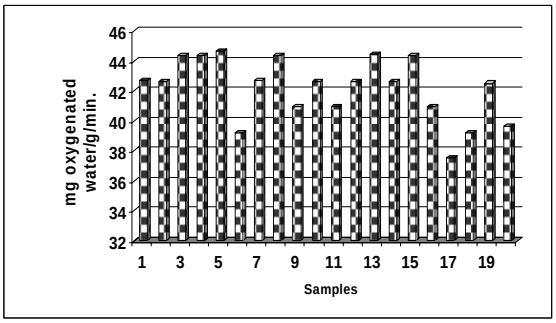

Fig. 1. Activity of catalase in muscles at *Aristichthys nobilis*

Utilization of the average values of the standard deviation permitted calculation of the inferior and superior limit of the confidence intervals, on the basis of the critical value t (α, n-1) given by α = 0.05 and n-1 degrees of freedom - i.e., with a probability of 95%.

Fig. 2 shows that the limits of the confidence intervals of catalase's activity in muscles are relatively narrow, in some cases being extremely reduced (44,031 - 44,702 mg H_2O_2 / g / min., 40,223 - 41,689 mg H_2O_2 / g / min., 43,922 - 44,817 mg H_2O_2 / g / min., 42,074 - 42,973 mg H_2O_2 / g / min. and, respectively, 39,241 - 40,005 mg H_2O_2 / g / min.).

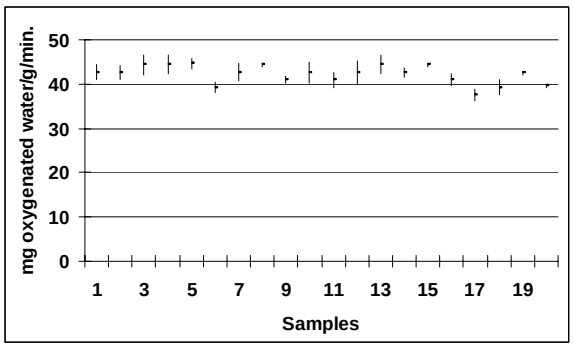

Fig. 2. Confidence intervals of catalase's activity in muscles at *Aristichthys nobilis*

As to muscular catalase at silver carp, the limits of activity range between 49.58 - 76.80 mg H_2O_2 / g / min. Special mention should be made of the fact that, in more than 50% of the individuals under study, the catalasic activity varies around a value of 53 mg H_2O_2 / g / min. (Fig. 3).

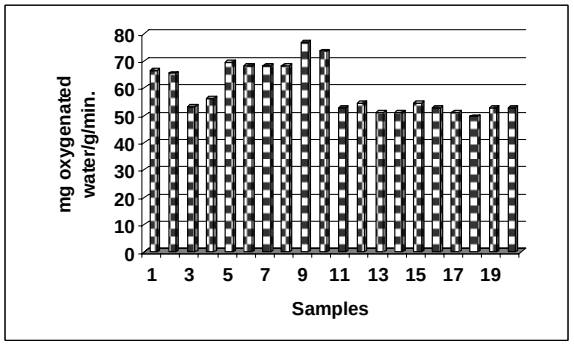

Fig. 3. Activity of catalase in muscles at *Hypophthalmichthys molitrix*

In the case of silver carp, the limits of the confidence intervals are extremely reduced, which is to be observed, too, in the case of the bighead carp, the lowest intervals ranging between 65.026 - 66.047 mg H_2O_2 / g / min. and, respectively, 52.913 - 53.559 mg H_2O_2 / g / min. (Fig. 4).

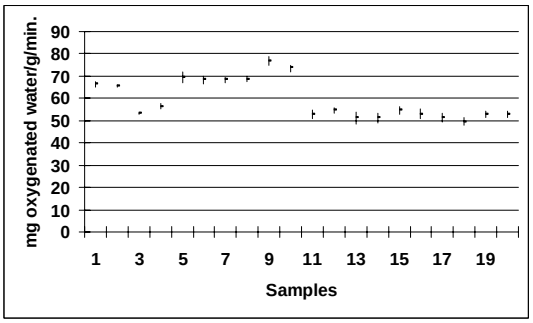

Fig. 4. Confidence intervals of catalase activity in muscles at *Hypophthalmichthys molitrix*

In order to check the possible difference or similarities occurring between the activity of catalase in the two species under study, the Anova test - the unifactorial model, with an equal number of observations in the cell, has been applied (FOWLER *et al.*, 2000); also, a comparative graphical representation of the enzymatic activity has been drawn (Fig. 5).

Starting from the experimental results obtained, the null (H_0) and the alternative (H_1) hypothesis of the test have been formulated.

As the calculated value of the factor (72.658) is much higher comparatively with the critical value (4.098), the null hypothesis is to be rejected, being accepted instead the alternative one; in other words, the activity of muscular catalase is significantly different in the two species.

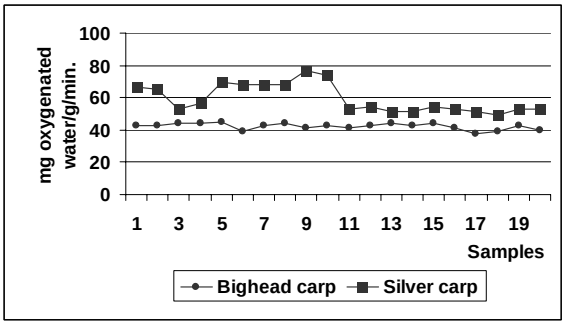

Fig. 5. Catalase activity in *Aristichthys nobilis* and *Hypophtalmichthys molitrix*

CONCLUSIONS

The experimental results obtained led to the following general conclusions:

1. In the case of *Aristichthys nobilis*, the activity of muscular catalase shows moderate variations from one individual to another, ranging between 37.55 - 44.656 mg H_2O_2 / g / min.; in *Hypophthalmichthys molitrix*, the variation scale is larger, the values recorded oscillating between 49.58 - 76.80 mg H_2O_2 / g / min.
2. The limits of the confidence intervals are extremely narrow for both species under study, which demonstrates that the values obtained have a very low degree of error.
3. A comparative analysis of the activity of muscular catalase shows the existence of a significant difference between *Aristichthys nobilis* and *Hypophthalmichthys molitrix*.

REZUMAT

Lucrarea prezintă studiul comparativ al activității catalazei musculare la câte 20 de exemplare de novac (Aristichthys nobilis) şi, respectiv, sânger (Hypophthalmichthys molitrix) în vârstă de doi ani din acumularea Ezăreni, județul Iaşi.

Activitatea enzimatică s-a determinat prin metoda titrimetrică cu permanganat de potasiu, pentru fiecare probă în parte realizându-se câte trei determinări paralele, rezultatele fiind prelucrate statistic. Cercetările realizate evidențiază existența unor diferențe semnificative ale activității catalazice la speciile studiate.

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