

## ON THE ACTIVITY OF $\alpha$ -AMYLASE IN SOME SPECIES OF ASIAN CYPRINIDS

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**Key words:** bighead carp, silver carp,  $\alpha$ -amylase

**Abstract:** The aim of this study was to observe if there are differences between the activity of intestinal  $\alpha$ -amylase in two Asian cyprinids namely, bighead carp (*Aristichthys nobilis*) and silver carp (*Hypophthalmichthys molitrix*). The activity of  $\alpha$ -amylase has been determined by the Métais-Bieth method, the results obtained being expressed as mg starch / ml x 30 min. Our experimental data evidence some differences between the activity of  $\alpha$ -amylase from the digestive tube, in the two species under study.

### INTRODUCTION

The digestion process in fish is similar to that of the terrestrial homeothermal animals, although it evidences a series of adaptations specific to the habitat of the poikilo-thermal organisms.

In the adaptation reactions of the animal organisms to the ever-changing conditions of the external environment, a special part is played by the digestive apparatus, particularly by the enzymes taking part to digestion, the food being firstly subjected to the action of such enzymes.

The digestive tractus of fish contains a large spectrum of hydrolases, which facilitate scission of the various nutrients and integration of their decomposition products into the cellular and tissular metabolism. In various fish species, these enzymes are differentiated, firstly by the level of their catalytic activity (ARTENIE *et al.*, 1984).

The food entering the gastro-intestinal tractus is subjected to some complex biochemical transformations, realized by the specific enzymes of the digestive organs. In the digestive tractus of cyprinids, there prevail the enzymes involved in polyglucides' hydrolysis, of which a special part is played by  $\alpha$ -amylase (ARTENIE, 1990).

In the case of fish,  $\alpha$ -amylases are present along the whole length of the digestive tractus, once known that the relative activity of such enzymes is closely correlated with the nature of the alimentary regime (OPREA *et al.*, 2000).

Most authors suggest that, in the case of carnivorous fish, the level of amylolytic activity is reduced, as a result of the low secretion of amylase (PĂLTĂNEA *et al.*, 1995).

### MATERIALS AND METHOD

For the experiments, samples have been collected from the median region of the digestive tube (between the esophagus and the duodenum) from 20, two year-old individuals belonging to the *Aristichthys nobilis* (bighead cap) and *Hypophthalmichthys molitrix* (silver carp) species from the accumulation of Ezăreni, the district of Jassy.

The activity of  $\alpha$ -amylase has been determined by the Métais-Bieth method, the results obtained being expressed as mg starch / ml x 30 min. (COJOCARU, 2005).

For each individual in part, the intestinal content has been removed through scraping, three parallel dosings being made each time, the data presented representing the average value of these repetitions.

### RESULTS AND DISCUSSION

In *Aristichthys nobilis*, the activity of  $\alpha$ -amylase is relatively homogeneous for each sample taken into study. Thus, the minimum value of enzymatic activity is of 2.344 mg starch / ml x 30 min., while the maximum value is of 2.876 mg starch / ml x 30 min., most of the individuals evidencing nevertheless an activity situated around the average value (2.653 mg starch / ml x 30 min.) (Fig. 1).

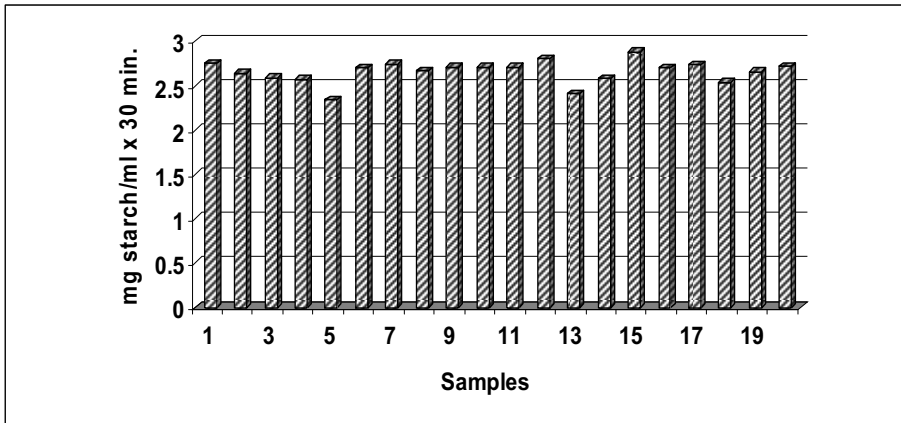


Fig.1. Activity of intestinal  $\alpha$ -amylase at *Aristichthys nobilis*

It is generally known that the value of the provided food determines, to a certain extent, differentiation of the digestive enzymes, that is, the metabolization rate of food depends on its quality and composition. Consequently, the activity of  $\alpha$ -amylase records considerable increases when an additional amount of polyglucides is incorporated into the food (ARTENIE *et al.*, 1983). In this respect, mention should be made of the fact that no additional food has been administered to the 20 organisms considered for the study.

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

Figure 2 shows that the confidence intervals of the enzymatic activity take vary narrow values, somewhat larger limits being recorded in individuals 2, 3, 7, 8 and 12 (2,523 - 2,754 mg starch / ml x 30 min., 2,444 - 2,733 mg starch / ml x 30 min., 2,639 - 2,839 mg starch / ml x 30 min., 2,533 - 2,784 mg starch / ml x 30 min. and, respectively, 2,699 - 2,904 mg starch / ml x 30 min.).

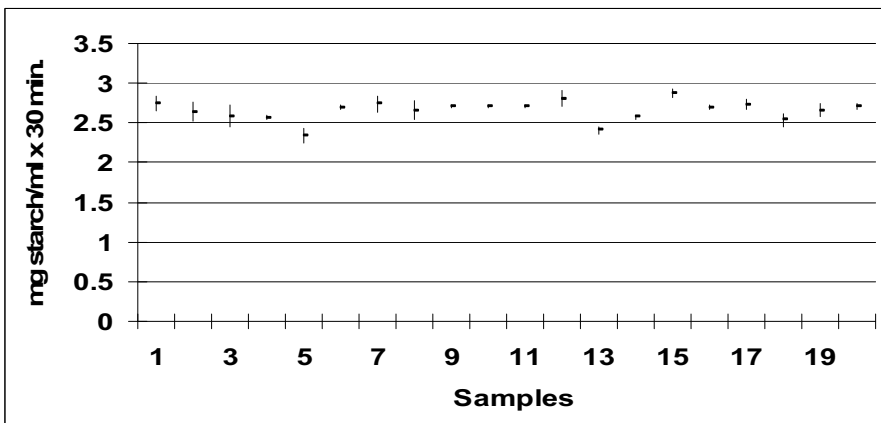


Fig.2. Confidence intervals of intestinal  $\alpha$ -amylase at *Aristichthys nobilis*

In the organisms belonging to the *Hypophthalmichthys molitrix* species, it has been observed that the activity of  $\alpha$ -amylase takes extremely uniform values, ranging in the 2.276 - 2.914 mg starch / ml x 30 min. interval. Comparatively with the other species taken into study, one may assert that, in the case of silver carp, the intestinal  $\alpha$ -amylase takes more homogeneous values, with the exception of individual 15, in which maximum enzymatic activity is to be recorded (2.914 mg starch / ml x 30 min.) (Fig. 3).

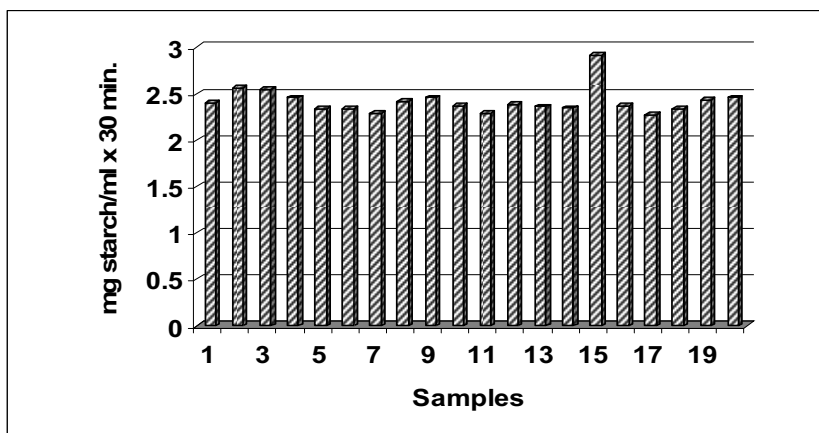


Fig.3. Activity of intestinal  $\alpha$ -amylase at *Hypophthalmichthys molitrix*

The limits of the confidence intervals of  $\alpha$ -amylase activity in the digestive tube of the silver carp individuals under study are extremely narrow (Fig. 4).

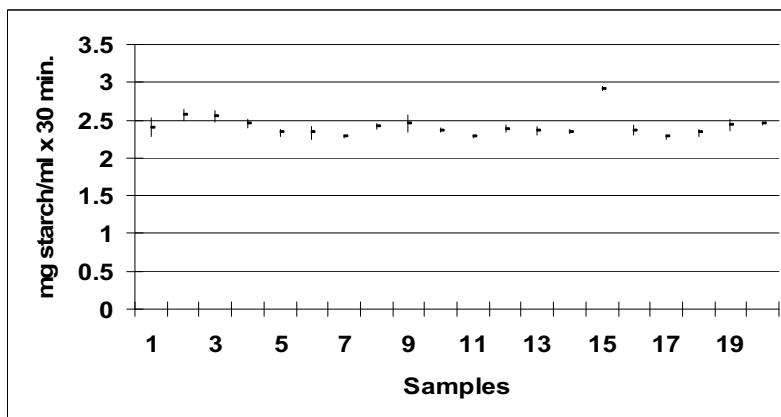


Fig.4. Confidence intervals of intestinal  $\alpha$ -amylase at *Hypophthalmichthys molitrix*

In order to check the possible differences or similarities occurring between the activity of  $\alpha$ -amylase 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).

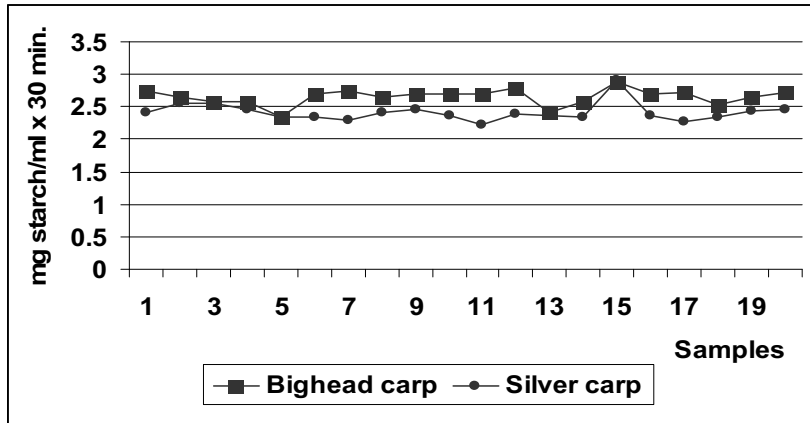


Fig.5.  $\alpha$ -Amylase activity in *Aristichthys nobilis* and *Hypophthalmichthys molitrix*

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 (31.909) 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 intestinal  $\alpha$ -amylase is different in the two species.

## CONCLUSIONS

The experimental results attained permitted drawing of the following conclusions: The activity of  $\alpha$ -amylase from the digestive tube shows no large variation limits, ranging between 2,344 - 2.876 mg starch / ml x 30 min. in *Aristichthys nobilis* and, respectively, 2.276 - 2.914 mg starch / ml x 30 min. in *Hypophthalmichthys molitrix*. In both species under study, the limits of the confidence intervals of  $\alpha$ -amylase activity are extremely narrow. A comparison between the calculated and the critical values of the factors evidenced some differences between the activity of  $\alpha$ -amylase from the digestive tube, in the two species of Asian cyprinids considered.

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