

## STUDY OF SOME BIOCHEMICAL PARAMETERS IN THE GRASS CARP

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**Abstract:** The experimental investigations were devoted to some biochemical parameters (glycogen, catalase, alanine- and aspartate-aminotransferase) in three summer-old representatives of grass carp, at the level of the hepatic and muscular tissue. The results obtained evidenced significant differences between the tissues under analysis, both in the concentration of the main reserve polyglucides, as a supplier of circulating glucose, and in the enzymatic activity, in close correlation with the physiological and biochemical role of each tissue in part.

### INTRODUCTION

The manifestation of glucidic metabolism in any organism is governed by an essential physiological condition, namely maintenance of a constant value of glycemy, which may result from the perfect equilibrium established among the action of certain hormones with antagonistic effects: hypoglycemic insulin, adrenaline and cortisone. The literature of the field makes mention of the direct influence of cortisone and epinephrine on the metabolism of glycogen at the level of the muscular tissue, the above-mentioned hormonal adjustment inducing an oscillating glycemy between the cellular medium and the extracellular liquids (FROLOW and MILLIGAN, 2004).

An important characteristics of glycogen and glucose concentration in fish is their high sensibility under conditions of stress, inanition and diseases, high growing densities, large variations of temperature (KIEFFER and TUFTS, 1998; HYNDMAN *et al.*, 2003; LERMEN *et al.*, 2004; MISĂILĂ *et al.*, 2009), high degree of water pollution (KUMAR *et al.*, 1986; SINGH and SINGH, 2002; RAMAKRITINAN *et al.*, 2005), tropical spectrum (HICKIE *et al.*, 1989; LEE *et al.*, 2003; KROGDAHL *et al.*, 2004) etc., the modification of the normal values of these biochemical indices being frequently employed in the diagnosis of such cases.

Catalase, an enzyme belonging to the class of oxidoreductases and playing an essential biologic role, decomposes the oxygenated water that may be possibly formed in the living cell as a result of various metabolic processes, under various unfavorable conditions. According to some authors, catalase is an adaptation enzyme in fish, its activity being possibly influenced by a series of factors, such as: temperature, density, quality of the administered food, age, sex, etc. (ARTENIE, 1990; CIOFU *et al.*, 1990; ANSALDO *et al.*, 2000).

In the reactions of fish adaptation to the growing conditions, a special part is played by the enzymes involved in processes of biosynthesis and proteic degradation, of vital importance among them being the aminotransferases which catalyze the transamination reactions. Among them, alanine- and aspartate-aminotransferase evidence an intense catalytic activity, being frequently occurring in various animal organs, such as: liver, myocardium, skeletal muscle, kidneys etc., while the activity of the two aminotransferases is more reduced in the sanguine serum (COJOCARU, 2005).

The present study systematizes the results of the investigations on glycogen concentration, as well as the catalasic and aminotransferasic activity at the level of the muscular and hepatic tissue in three summer-old representatives of the *Ctenopharyngodon idella* species, grown under controlled conditions.

### MATERIALS AND METHODS

In the investigations, five individuals of three summer-old grass carp (*Ctenopharyngodon idella*) from the Piscicultural Farm of Țigănași, the county of Iași, have been employed. The five individuals were brought in the laboratory and sacrificed, fresh samples of hepatic and muscular tissue - from which a series of biochemical parameters have been subsequently determined - being taken over. The concentration of glycogen was estimated by the method with anthrone, the catalase - by the titrimetric method with potassium permanganate, while the transaminases - by the colorimetric method with 2,2-dinitrophenylhydrazine (ARTENIE and TĂNASE, 1981; COJOCARU *et al.*, 2009).

### RESULTS AND DISCUSSION

A first objective of the present study was to determine the glycogen concentration at the level of the two tissues under analysis. Thus, as evidenced in Figure 1, the amount of hepatic glycogen (287.2 mg%) is higher than the muscular one (187 mg%), once known that the liver is

the main organ in which the reserve substances are deposited, and also the center of substances' metabolism.

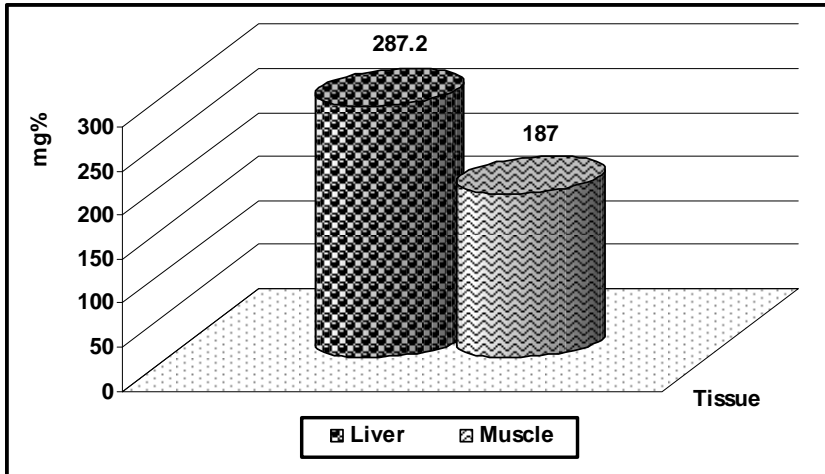


Fig.1. Muscular and hepatic glycogen concentration in grass carp

As to the activity of catalase, a reverse situation should be mentioned, namely: this time, the maximum value - which is about three times higher than the hepatic one - was recorded in the muscular tissue, which is probably strongly correlated with the fact that, as aquatic organisms, the enzymatic processes they develop are much more intense at the level of the muscular tissue (Fig. 2).

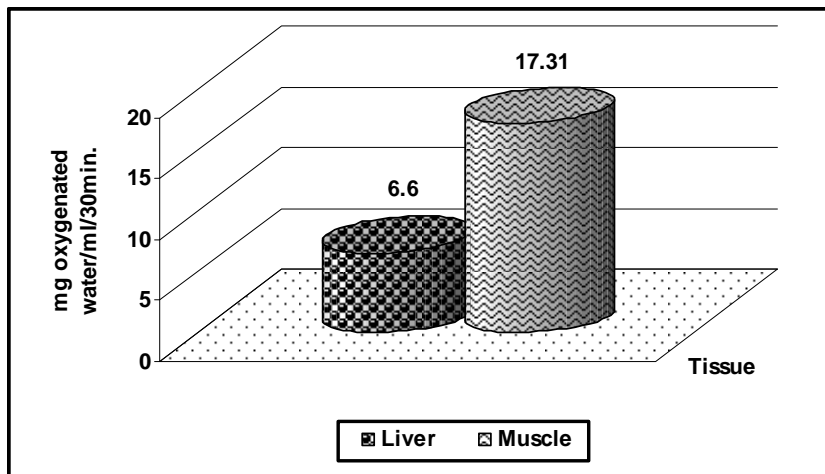


Fig.2. Muscular and hepatic catalase activity in grass carp

A following step of the investigation was to determine the activity of alanine- and aspartate-aminotransferase in the two tissues. Special mention should be made of the fact that, on one hand, the transaminasic activity records higher values at the level of liver (89.94 UE/g/min.

in the case of alanine-aminotransferase and 31.8 UE/g/min., respectively, in the case of aspartate-aminotransferase) while, on the other, the alanine-aminotransferase is approximately three times more active than the aspartate-aminotransferase, in both liver and muscle (Figs. 3 - 4).

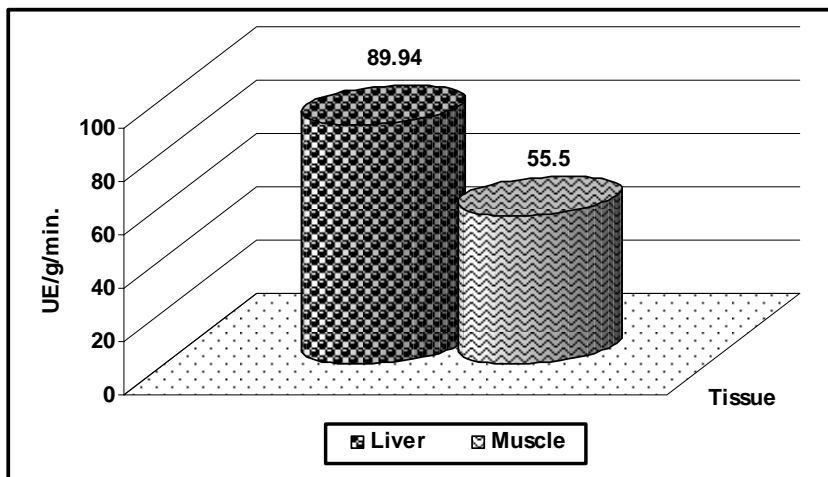


Fig.3. Muscular and hepatic alanine-aminotransferase activity in grass carp

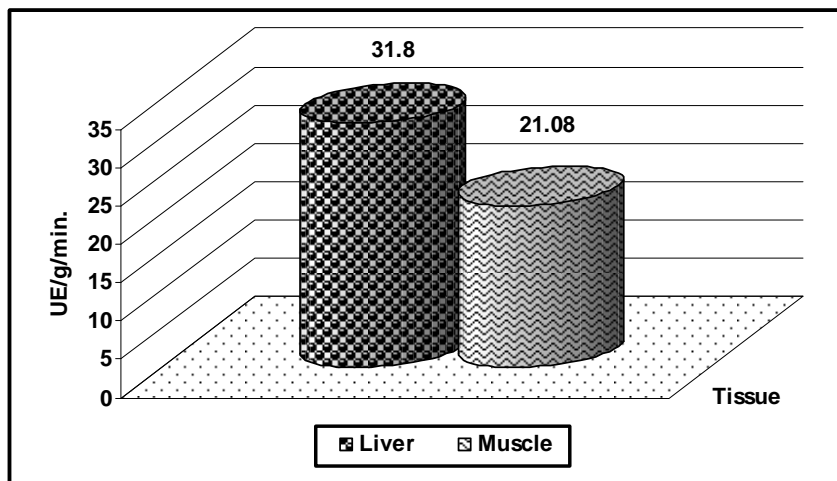


Fig.4. Muscular and hepatic aspartate-aminotransferase activity in grass carp

## CONCLUSIONS

Analysis of the experimental results led to the following conclusions:

In fish organisms, the main reserve polyglucide evidences an oscillating concentration, as a function of the tissue under investigation, the liver being the organ in which glycogen is present in highest amounts.

Catalase, an adaptation enzyme in fish, evidences higher values of activity at muscular level, in relation with the specific role played by this tissue, while alanine- and aspartate-aminotransferase are more active in the hepatic tissue, the former one being even more active, which is probably closely correlated with the higher level of alanine in the mobilized proteins.

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