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Serum biochemical parameters of farmed carp (*Cyprinus carpio*)

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Abstract. Despite advances in ichthyo-pathology of recent years, interpretation of fish serum biochemical parameters is often difficult by lack of reference values. That is why to know the value of the serum biochemical parameters can be a useful tool for monitoring health status, detecting illnesses and responses to therapy. This paper provides data concerning biochemical composition of carp serum (*Cyprinus carpio*) bred at Brateş Farm of Institute of Research and Development for Aquatic Ecology, Fishing and Aquaculture from Galaţi and Pleaşa Farm from Ploieşti, Romania. In research conducted on *Cyprinus carpio* were determined following serum biochemical parameters: glucose (GLU), total proteins (TP), blood urea nitrogen (BUN), cholesterol (CHOL), triglyceride (TRIG), sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), phosphorus (P), iron (Fe).
Key Words: carp, biochemical parameters, serum, reference values.

Rezumat. În ciuda progreselor în ihtiopatologie din ultimii ani, interpretarea parametrilor biochimici serici la peşti este adesea dificilă din lipsa valorilor de referinţă. Din această cauză, cunoaşterea valorii unor parametri biochimici serici poate fi un instrument util pentru monitorizarea stării de sănătate, depistarea bolilor şi a răspunsurilor la terapie. Această lucrare oferă date referitoare la compoziţia biochimică a serului de crap (*Cyprinus carpio*) crescut la Ferma Brateş din cadrul Institutului de Cercetare – Dezvoltare pentru Ecologie Acvatica, Pescuit şi Acvacultură – Galaţi si la Ferma Pleaşa – Ploieşti, Romania. În cercetarile efectuate pe specia *Cyprinus carpio* au fost determinaţi urmatorii parametri biochimici din ser: glucoza (GLU), proteine totale (TP), uree (BUN), colesterol (CHOL), trigliceride (TRIG), sodiu (Na), potasiu (K), calciu (Ca), magneziu (Mg), fosfor (P), fier (Fe).
Cuvinte cheie: crap, parametri biochimici, ser, valori de referinţă.

Introduction. In aquaculture, as in any other sector where work is done on alive organisms, to get a high production is conditioned by awareness and keeping of an unaltered health condition of the biological material (Farahi et al 2010; Csep et al 2010). That is why to know the values of serum biochemical parameters enables us to differentiate the normal physiological condition of the animal under research from the eventual pathological modifications having occurred due to the disease in the organism (Asadi et al 2006ab; Bahmani et al 2010; Kataria et al 2010; Muñoz et al 2010).

Glucose (GLU) represents a permanent and immediate source of energy necessary for the operation of heart and of the muscles. To dose the serical glicemy at fish represents the fastest and cost efficient method of evaluating the stress condition (Silbergeld 1974). Environmental stress can be also the cause of marked elevations in serum glucose concentration (Silbergeld 1974). Changes in serum glucose level are especially associated with renal injury (Coimbra et al 2000). Further, nutritional condition can have an important influence on glucose level. To keep the glucose within certain normal limits is one of the mechanisms with the finest homeostatic adjustment, to which the hepatopancreas participates, as well as some extrahepatic tissues and a series of endocrine glands (Dobšikova et al 2009; Nordlie 2009; Natochin et al 1995; Patriche et al 2010; Shahsavani et al 2010; Velisek & Svobodova 2004).

Total serum protein (TP) represents the most important indicator of the nutritional condition of the organism and of fish health condition. The concentration of total protein decrease in many disease states due to decreased capacity of synthesis,

reduced absorption, or protein loss (Bernet et al 2001; Yang & Chen 2003). From the chemical point of view, the plasmatic proteins represent a heterogeneous mixture of about 100 components with physical-chemical proprieties and different functions; some of them are molecular chaperones, directly involved in fish homeostasis (Petrescu-Mag et al 2007a-c; Petrescu-Mag & Petrescu-Mag 2010).

Blood urea nitrogen (BUN) resulted from the proteins catabolism. In mammals, increased concentrations of urea occur due to a high-protein diet or to renal lesions (Jacobson-Kram & Keller 2001).

Creatinine (CREA) provide information in renal disease or postrenal obstruction or leakage. Whereas increased the creatinine concentrations in blood may reflect kidney dysfunction due to structural damage, low concentrations have no clinical significance (Jacobson-Kram & Keller 2001).

Cholesterol (CHOL) is an important structural component of cell membranes, the outer layer of plasma lipoproteins, and the precursor of all steroid hormones. Decreased of the cholesterol level indicate a possible disease, an increased degree of physiological discomfort (stress), a dysfunction at lipidic metabolism.

Triglyceride (TRIG) level can be used as an indicator of nutritional condition, as well serum total protein and cholesterol. The most important function of triglyceride is to store and provide cellular energy.

Electrolytes (Na, K, P, Ca, Mg and Fe) have multiple physiological roles in the body. The extra- and intracellular distributions of these ions are essential for control of osmotic equilibrium and the cellular hydro-ionic exchange, as well as for maintaining the membrane permeability. The high values of this parameter indicate membrane destabilization, depolarization and a higher passive permeability.

Material and Method. In order to determine the value of serum biochemical parameters (GLU, TP, BUN, CREA, CHOL, TRIG, Na, K, Ca, P, Mg, Fe) blood samples have been collected from 217 carps (*Cyprinus carpio*) of different age and weight.

The carp were produced by artificial reproduction and were reared in Brateş Farm from Galaţi and Pleaşa Farm from Ploieşti, Romania, in the period 2005-2008.

Blood sampling was performed immediately after the fish were captured. Samples were collected from behind the anal fin using a plastic syringe and were placed into dry plastic tubes. After separation of serum from the samples by centrifugation (10 min at 3,000 rpm), they were analyzed using dry biochemical auto-analyzer VITROS 750 and human standard methods. To reduce possible dietary influence at value of the serum biochemical parameters, fish were not fed on the day of blood collection.

Results and Discussion. The analysis of blood biochemical parameters is one of the most valuable modern methods because it has been shown that their physiological values are species-specific. The serum levels of measured blood biochemical parameters of farmed carp are shown in Table 1.

Table 1

Serum biochemical parameters of farmed carp (*C. carpio*)

Parameters	*Measure unit*	*1 years*	*2 years*
GLU	mg dL^{-1}	53±26.5	71±20.4
TP	mg dL^{-1}	3.32±0.43	3.82±0.38
BUN	mg dL^{-1}	8.7±0.9	9.8±1.4
CREA	mg dL^{-1}	0.45±0.15	0.51±0.17
CHOL	mg dL^{-1}	109.5±9.5	124.3±7.8
TRIG	mg dL^{-1}	232.5±71.2	312.5±83.4
Na	m mol dL^{-1}	126.6±5.9	121.3±8.5
K	m mol dL^{-1}	2.2±0.73	3.8±0.55
Ca	mg dL^{-1}	11.95±1.15	12.71±0.58
Mg	mg dL^{-1}	5.36±0.64	9.6±0.92
P	mg dL^{-1}	23.65±5.7	14.2±3.2
Fe	µg dL^{-1}	23.6±7.4	28.2±5.2

mg dL^{-1} – milligrams per deciliter, m mol dL^{-1} – millimole per deciliter, µg dL^{-1} – micrograms per deciliter.

The blood parameters varied considerably between the two age categories of carps. Compared with the 1 year old carps, concentrations of GLU, BUN, TP, CHOL and TRIG were significantly higher in the 2 years old carps. Electrolyte levels, such as K, Ca, Mg, Fe, of 2 years old carps were significantly lower than in case of 1 year old carps, while the Na, P levels were significantly higher in the 1 year old carps.

Conclusion. Factors such as: age, sex, environmental conditions and diet, can significantly influence fish blood values of the biochemical parameters.

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