

CYPRINIDS TOTAL BLOOD PROTEINS DETERMINATION

DETERMINAREA PROTEINELOR TOTALE DIN SANGE LA CIPRINIDE

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In aquaculture to get a high production is conditioned by awareness and keeping of an unaltered health condition of the biological material. To be aware of the health condition of the biological material in a fish farm allows us to establish the preventive measures required to prevent spreading of a disease and the treatment to be applied in case that a mass disease occurs. The level of the total protein in serum is, first of all, a synthetically indicator of the nutritional condition of the organism, presenting, at the same time, ample qualitative and quantitative variations depending on species, age, sex, stage of sexual maturity, water temperature and especially in correlation with the health condition of fish. Modification in value of the total protein point out some metabolic perturbations in fish body.

Keywords: total protein in serum, determination, carp, disease.

Introduction

As per the illustrated elements, the main elements of blood are the plasmatic proteins, that is why to know their value represents an essential factor in determining the health condition of fish.

From the chemical point of view, the plasmatic proteins represent a heterogeneous mixture of about 100 components with physical-chemical proprieties and different functions. They are synthesized in liver, spleen, plasmatic cells, lymphatic ganglions and they carry out several functions in the organism as following:

- to maintain the normal volume and the steady osmotic pressure of blood;
- to carry numerous substances;
- to participate in the specific and nonspecific processes of defense of the organism;
- to maintain the acid-basic equilibrium of blood due to their amphoteric nature;

- to influence viscosity and microcirculation;
- to represent a considerable reserve of proteins of the organism.

Materials and Methods

Our research regarding determination of the total protein in serum of the fish have been made on the species most numerous in fish farms:

- carp (*Cyprinus carpio*);
- silver carp (*Hypophthalmichthys molitrix*);
- big head (*Aristichthys nobilis*);
- grass carp (*Ctenopharyngodon idella*).

In order to achieve the pursued goal, the studies have been made on blood samples collected from fish material of different age, weight and species originating from two fish farms:

- Pleaşa Fish Farm, Prahova County;
- Brateş Fish Farm, I.C.D.E.A.P.A. Galati;

Fish blood normally contains 3,5-5,5 mg total protein at 100 ml of blood (A.K. Siwieki, 1993), in comparison to 6,5-7,5 mg at 100 ml of blood, found in the blood of the healthy human being. For this reason, the same methods to determine total protein in the blood of human beings can be applied.

The total protein at fish, presents quite ample variations, also depending on a series of factors, such as: the food diet, species, season, degree of sexual maturity, water temperature and others.

Results and Discussion

The results registered during the performed study indicate for the protein level both normal values and values beyond the normal limits, that we interpreted depending on the species under study, the health condition of the fish material under study, age, sex, water temperature, season, quantity and quality of food.

a) Variations of the total proteins in serum of fish depending on the species

Determinations made in the period March 2004-November 2008, on blood taken from healthy adult fish indicated different values of the protein level.

The following table gives, for each species of fish under study, the values registered for the total protein in serum (table no.1).

Table no. 1

Display of total proteins in serum in different fish species

Species		Number of fish	Total protein in serum [g/dl]		
			minimum	maximum	average
Carp	Pleaşa	240	3,5	5	4,25
	Brateş	250	3	4,5	3,75
Silver carp		160	2,7	3,5	3,1
Big head carp		82	3,1	3,7	3,4
Grass carp		119	2,8	3,5	3,15

b) Values of the total protein in serum registered at fish in different diseases

Determinations made on blood taken from sick fish, 2 years old, indicated values of the total protein in serum lowered with more than 50% compared to the mean value determined during research, for each species under study (table no.2).

Table no. 2

Values of the total protein in serum registered at fish in different diseases

Species	Etiologic agent	Total protein [g/dl]
Carp Pleaşa	- <i>Aeromonas punctata</i>	- 1,5-1,8
	- <i>Lernaea cyprinacea</i>	- 1,6-1,7
Carp Brateş	- <i>Aeromonas punctata</i>	- 1,6-1,7
	- <i>Hepaticola petruschewski</i>	- 1,75-2,3
	- <i>Mucophilus cyprini</i>	
Silver carp Brateş	- <i>Hepaticola petruschewski</i>	- 1,75-2,35
	- <i>Mucophilus cyprini</i>	
Big head Brateş	- <i>Ligula intestinalis</i>	- 1,25-1,8

At Pleaşa Fish Farm, the examined individuals of the carp species (*Cyprinus carpio*) analizate, presented wounds, dystrophia, necrosis, inflammations, tousled scales, exoftalmia, characteristic marks the infectious dropsy – spring, erithrodermatitae, as well as parasitosis with inferior crustaceans (*Lernaea cyprinacea*).

The registered results presented values of the total protein in serum lowered up to 1.5 g/dl, in case of the sick individuals, in comparison to the average per species obtained at this fish farm at the healthy individuals, de 4,25g /dl;

At Brateş Fish Farm, I.C.D.E.A.P.A. Galati, the individuals that belonged to carp species (*Cyprinus carpio*), silver carp (*Hypophthalmichthys molitrix*) and grass carp (*Ctenopharyngodon idella*) presented a high degree of infestation with protosors (*Mucophilus cyprini*), nematods (*Hepaticola petruschewski*) and bacteria-based diseases in different stages, spring viremia, erithrodermatitae, and the big head species (*Aristichthys nobilis*) presented parasitosis with cestods (*Ligula intestinalis*).

The results registered at the examined sick individuals, presented values of the total protein in serum lowered when compared to the mean obtained at this fish farm for each species taken individually: carp 3,75 g/dl; silver carp 3,1 g/dl; big head carp 3,4 g/dl; grass carp 3,15 g/dl.

This decrease in the level of the total protein in serum is correlated with the lack of hunger at fish, because in the advanced stage of the disease, fish become listless and they refuse food.

c) Values of the protein level registered at cyprinids depending on the protein concentration of the food used in the growing technology

In case of the farmed fish, the protein level is kept within less variable limits in comparison to the protein level of the wild fish, as a result of the qualitative and quantitative control of the food used by the fish farmers. The technological need to maintain the level of protein of the food recipes, represent a basic condition for assuring the corresponding physiological strength of fish and a cost effective growing efficiency.

In case of the examined farmed cyprinids, demonstration was made that the protein level has values a little inferior to the species mainly vegetarian, in comparison to the mainly omnivore species. The explanation consists in the fact that a mixed diet is richer in animal protein than a mainly vegetarian diet.

The level of total protein in serum, in case of the farmed species, varies also depending on the concentration in protein of the food.

During the experiments, carp individuals fed with two food types were examined:

- **Batch I** - Brateş Fish Farm, I.C.D.E.A.P.A., food with 20-25% gross protein;

- **Batch II** - Pleaşa Fish Farm, food with 35-40% gross protein.

It has been clear, at the same species, that the food with a high level of protein induces a higher value of the total protein in serum when compared to the food poorer in protein (table no.3).

Table no.3

Values of the protein level registered at cyprinids depending on the protein concentration of the food used in the growing technology

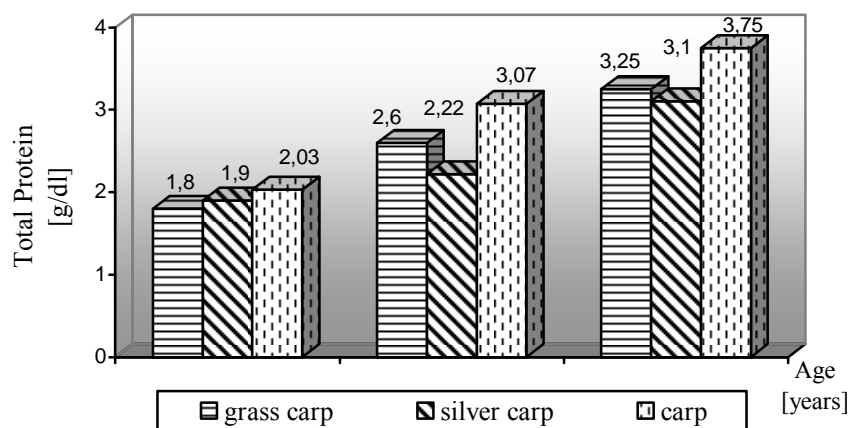
Gross protein [%]	Number of fish	Total protein in serum [g/dl]		
		minimum	maximum	average
20-25	250	3	3,5	3,25
35-40	240	3,2	4,7	3,95

d) Increase in the level of protein at cyprinids depending on age

In case of the farmed species from the Research- Development Centre Brateş Galaţi, it was clear that the level of the total protein in serum is increased by age, until normal values are reached. Thus, the carp juveniles and the Chinese major carp juveniles (0+), (1+), (2+) were monitored; the following values being obtained (diagram no.1).

Diagram no.1

Increase in level of protein on Cyprinides, expressed in g/dl, depending on age



e) Physiological modifications of the protein level of cyprinids depending on season

As far as the variation of the level of total protein in serum depending on season is concerned, through the comparative analysis of the results registered in autumn (October-November) and in spring (March-April) at the Research-Development Centre Brateş Galaţi, the objective was to determine the extent of

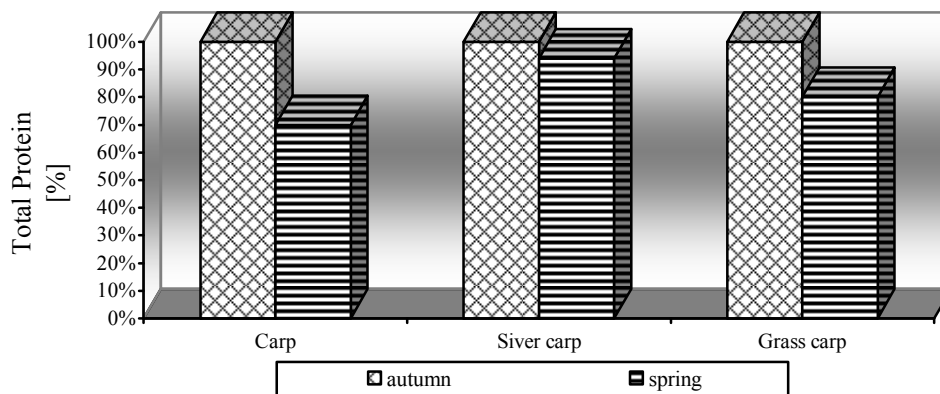
modifications of this indicator of the blood metabolic profile under the influence of the social and thermal cronical stress due to the winter time conditions.

The decrease in the protein level of fish occurs as a steady consequence of hypothermy and of decrease in oxygen content of water, as effect of the overdensity in the winter ponds, of the mixture of species and ages.

The spring analyses were made on cyprinid individuals, originating from the winter ponds, where all fish were in a cronical stage of inanition, installed simultaneously with passing through winter, aspect to be correlated with the evolution of the values registered for the total protein in serum (diagram no.2).

Diagram no.2

Level of protein in percentage on cyprinids depending on season



Thus, it is obvious that in case of carp species the level of protein is higher in autumn and it can decrease with 30% in spring; in case of silver carp, the level of protein is almost steady, the difference between autumn and spring being of about 2-6%; in case of grass carp, the difference between the level of protein registered in autumn and the one registered in spring is of about 15-20%.

The cold season conditions also affect more the physiological condition of the one year old individuals of *Cyprinus carpio* of in comparison to the same two year old species.

Conclusions

- The value of the total protein in serum represent the most important biochemical indicator of the nutritional condition of the organism and of fish health condition.
- The low level of protein indicates a non corresponding contribution of protein to food, and its lack in the period of intense activity of fish can

accelerate the protein catabolism, until the total exhaustion of organism is reached.

- In case of the examined farmed cyprinids, demonstration was made that the protein level has values a little inferior, depending on the concentration in protein of the food given in the growing period.
- The data registered during the study indicates a direct correlation between the level of the total protein in serum and the temperature of fish growing water, the hypoprotein level being more accentuated while the hypothermy is increased.
- After the study made by us, it was obvious that the ample perturbation of the homeostatic equilibrium of the farmed fish organism by installation of the disease condition is directly bound to the modification of the value of protein level in blood. A correlation was found between the value of protein level and the massivity of the infestation degree. The more infested the fish, the lower the value of the protein level.

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