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RESEARCHES REGARDING THE HAEMATOLOGICAL PROFILE OF JUVENILE *CYPRINUS CARPIO* VARIETIES

Monica MARIN, Carmen NICOLAE, D. DRĂGOTOIU, Laura URDEŞ, I. RĂDUCUȚĂ, Georgeta DINIȚĂ

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Mărăşti Blvd, District 1, 011464, Bucharest, Romania, Phone: +4021.318.25.64, Fax: + 4021.318.25.67

Corresponding author email: marin_monica_zoo@yahoo.com

Abstract

The carp is the main aquaculture species which is omnivorous, eating both vegetable and animal food. The aim was to analyze the research undertaken blood parameters at two varieties of carp fry culture, those common carp (Cyprinus carpio var. typica) and mirror carp (Cyprinus carpio var. specularis), which were grown with both natural food (zooplankton and phytoplankton) and with mixed food (natural and supplementary - cereal mixed with soybean meal). The weight of juveniles ranged between 25-45 g, and the blood parameters were determined during two periods, respectively in August and October. The values of blood parameters showed a physiological response similar to both varieties of carp, for similar living conditions. The number of erythrocytes, haemoglobin and the value of hematocrit were higher in summer than autumn, due to metabolic processes more pronounced in summer, when juvenile fish gets feed more intense. Moreover, the blood parameters were influenced by the variation of environmental factors, respectively the water temperature, its decrease causing the lowering of the analyzed blood parameters.

Key words*: carp, blood parameters, food type, water temperature.*

INTRODUCTION

Although carp is a species tolerant to environmental conditions, in fish farms must be ensured a good quality of water supply for the ponds and a right feeding to get proper productions in terms of economic efficiency. In Romania the carp grown in ponds and lakes, in monoculture or polyculture with other species of cyprinids (Chinese carp).

For the breeding in monoculture, it is recommended the use of small ponds (<5 ha), with water alimentation and independent exhaust. Productions are done in cycles of 2-3 summers (1.5-2.5 years) and may be obtained typically 2-3 t/ha, or 5-6 t/ha when using aerators or big flows of fresh water. Feeding is done traditionally with mixtures of cereals, fish meal and meal (soya or sunflower), usually taken in the farm (Parvu et al., 2003). In the last years it has began to be used extruded feed, which allow obtaining high productions, an excellent meat quality and economic efficiency by reducing the production cycle, of labor and other expenses. Common carp ("Romanian") is an omnivorous fish and it needs feed with a protein content of 25-30%, respectively 7-12% fat (Hangan et al., 2008).

The juvenile in the first year of life needs a feed richer in protein (over 35%).

Carp is harvested during the fall period and most of it is sold in the market, fresh or alive, at a weight of about 1.5-2 kg.

The aim was to analyze the research undertaken blood parameters at two varieties of carp fry culture, those common carp (*Cyprinus carpio* var. *typica*) and mirror carp (*Cyprinus carpio* var. *specularis*), which were grown with both natural food (zooplankton and phytoplankton) and with mixed food (natural and supplementary - cereal mixed with soybean meal).

MATERIALS AND METHODS

In order to follow the dynamics of blood parameters for the juvenile culture carp were analyzed two varieties, respectively the common carp (*Cyprinus carpio* var. *typica*) and mirror carp (*Cyprinus carpio* var. *specularis*), which were raised in two variants of feeding, with natural food (zooplankton and phytoplankton) and with mixed food (natural

and supplementary - cereal mixed with soybean meal).

The tested juvenile carp had relatively similar conditions of life: ponds were enclosed, with a surface area of about 2000 m^2; water supply was made from the same source; depths were similar; populating was done simultaneously with alevins coming from the same natural controlled breeding ponds.

The juvenile carp weight ranged between 25 and 45 g, while the blood parameters were determined in the same year, in two periods, respectively summer and fall, for 2 weeks (table 1).

Table 1. Experimental schema

Date of sampling	Carp species	n	Feeding procedure	Objectives
August	Common carp	40	Natural food Mixed food	Determination of blood parameters: - red blood cells number; - hemoglobin; - hematocrit; - eritrocyte index (mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration); - leukocyte count.
	Mirror carp	40	Natural food Mixed food	
October	Common carp	40	Natural food Mixed food	
	Mirror carp	40	Natural food Mixed food	

From the blood collected from the level of the caudal artery of carp from the experiment, have been determined using an automatic analyzer a number of blood parameters represented by the red blood cells number – RBC ($x10^6$ cells/µl blood), hemoglobin – Hb (g/dl), hematocrit – Ht (%) and the erythrocyte indici: the mean corpuscular volume – MCV (μm^3), the mean corpuscular hemoglobin – MCH (pg), the mean corpuscular hemoglobin concentration – MCHC (g/dl). It has also been determined the leukocyte count – WBC ($x10^3$/ µl blood) from the sampled blood.

Derived parameters were calculated according to the following formulas:

MCV=(Ht×10)/RBC

MCH=Hbx10/RBC

MCHC=(Hb×100)/Ht

The obtained results were subjected to statistical analysis using the Student test.

RESULTS AND DISCUSSIONS

Data regarding the blood profile of juveniles belonging to the common carp and the mirror carp are shown in the tables 2 and 3.

The red blood cells number varied for the blood samples collected in August from the common juvenile carp between 1.32 x 10^6/µl (in case of natural feeding) and 1.58 x 10^6/µl (in the case of mixed feeding). In October, when the water temperature has decreased, there was a decrease in the recorded values, respectively 1.14 x 10^6/µl (in the case of natural feeding) and 1.40 x 10^6/µl (in the case of mixed feeding), the recorded differences being significantly distinct.

For the juvenile mirror carp, it was found the same trend of red blood cells decrease in the number determined by water temperature drop, respectively by the season. Also, there was a slight increase of the recorded values at this variety of carp (about 5%), which demonstrates a better adaptation to environmental conditions.

The hemoglobin content of the blood collected from juvenile carp recorded similar values for the two varieties, ranging between 7.91 and 5.64 g/dl, significant decreases being seen when water temperature drops to 14°C. In these conditions, higher values can be found in the case of mixed feeding.

A similar situation was observed in the case of hematocrit values, which ranged between 35.78 and 30.63%.

One of the determined erythrocyte indices was MCV which recorded the highest value (268 μm^3) for the both varieties in October, at a water temperature of 14°C, in the case of natural feeding.

Table 2. Dynamics of blood parameters determined for the juvenile common carp

Date of sampling	Number of studied samples	Water temperature (°C)	Feeding procedure	RBCx10^6 cells/µl blood	Hb g/dl	Ht %	MCV µm^3	MCH pg	MCHC g/dl	WBC x10^3/ µl blood
August	40	26	Natural food	1.32± 0.04	6.54± 0.65	32.51± 1.25	246.29± 4.22	49.54± 1.87	20.12± 0.95	63.21± 3.17
	40	25	Mixed food	1.58± 0.05	7.78± 0.44	35.34± 0.99	223.67± 5.04	49.24± 3.26	22.01± 1.25	62.76± 4.73
October	40	14	Natural food	1.14± 0.03	5.64± 0.52	30.63± 1.76	268.84± 3.95	49.47± 4.65	18.41± 1.47	62.34± 2.99
	40	13	Mixed food	1.40± 0.04	6.60± 0.31	33.15± 1.65	236.86± 5.36	47.14± 2.17	19.91± 2.05	61.16± 3.06

Table 3. Dynamics of blood parameters determined for the juvenile mirror carp

Date of sampling	Number of studied samples	Water temperature (°C)	Feeding procedure	RBCx10^6 cells/µl blood	Hb g/dl	Ht %	MCV µm^3	MCH pg	MCHC g/dl	WBC x10^3/ µl blood
August	40	24	Natural food	1.40± 0.05	6.77± 0.22	34.48± 1.37	246.28± 5.76	48.36± 2.69	19.63± 2.63	62.36± 4.14
	40	25	Mixed food	1.60± 0.03	7.91± 0.40	35.78± 1.29	223.62± 4.06	49.44± 1.75	22.11± 0.79	63.11± 3.65
October	40	13	Natural food	1.20± 0.04	5.89± 0.36	32.24± 1.07	268.67± 6.12	49.08± 3.49	18.27± 1.48	61.79± 2.89
	40	13	Mixed food	1.46± 0.03	6.90± 0.29	34.57± 1.32	236.78± 4.92	47.26± 2.75	19.96± 2.15	61.39± 3.26

Another determined erythrocyte indicator was MCH, that registered close values, the lowest being during the fall, in the case of mixed feeding (47 pg).

The third determined erythrocyte indicator was MCHC, which recorded higher values in the case of mixed feeding, for both varieties, both during summer, as well as in autumn (22.11, respectively 19.96 g/dl).

In the case of the leukocyte number, the values obtained did not register significant differences depending on the type of feeding, noticing a slight decrease of the values in the case of water temperature decrease (61.16 x10^3/µl blood).

As a consequence of the undertaken research by applying different technological conditions, different values of carp hematological profile were recorded, varying for RBC 0.70-2.50 x 10^6/µl, hemoglobin between 3.00 and 11.00 g/dl, for hematocrit 20.00-45.00%, for MCV 115-368 µm^3, for MCH 18-69 pg, for MCHC 12-35 g/dl (Bocioc et al., 2015; Darvish et al., 2008; Svobodova et al., 2008; Witeska et al., 2010).

CONCLUSIONS

After the undertaken research regarding the determination of the hematologic profile for the

juvenile carp varieties common carp *Cyprinus carpio* var. *typica*) and mirror carp (*Cyprinus carpio* var. *specularis*) have been established the following aspects:

- The values of blood parameters showed a physiological response similar to both varieties of carp, for similar living conditions.
- The number of erythrocytes, haemoglobin and the value of hematocrit were higher in summer than autumn, due to metabolic processes more pronounced in summer, when juvenile fish gets feed more intense.

The blood parameters were influenced by the variation of environmental factors, respectively the water temperature, its decrease causing the lowering of the analyzed blood parameters.

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