

The Blood Biochemical Profile as an Objective Welfare Indicator in a Sturgeon Farm

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Abstract. Biochemical profile is, along with water quality, an indicator for fish welfare assessment, revealing their level of stress. For establishing blood biochemical profile there were taken blood samples from female and male sturgeons by caudal vein puncture with ventral point of election. Determinations were made with 8008 Vetest device and interpretation of results was done according to reference values in the literature. The obtained results (increased alanin aminotransferase - ALT and alkaline phosphatase, decreased glucose and magnesium), shows that sturgeon welfare in the farm is medium.

Keywords: sturgeons, welfare, biochemical profile

INTRODUCTION

Sturgeon development and spreading have entered a new phase with the large hydrotechnical works and especially with rivers' hydroenergetic closing up which prevent migration to natural breeding sites [1, 2, 6].

Currently, sturgeons are among the species protected by law, which is why more and more farms appear, both to ensure meat and caviar production and for Danube Delta repopulation. In recent years, the man began to better understand the role aquaproducts in maintaining consumers' health.

Among the indicators for assessing fish welfare there are the biochemical ones used for determining the stress levels in fish [5].

Many studies were conducted in order to improve sturgeon's living conditions in captivity, which means increasing the quality of meat and roe and the appearance of generations of healthy fish, so in the future Danube Delta could host again its almost disappeared "gold" [4].

MATERIALS AND METHODS

In order to establish the biochemical profile of sturgeon there were taken blood samples from several fish in the farm.

Blood samples were collected from specimens that were removed from the pool, after a manual restraint, by vein puncture with ventral point of election.

From the blood samples the following parameters were determined: blood urea nitrogen (BUN), creatinine, uric acid, calcium, total protein, albumin, globulin, ALT, aspartat

aminotransferase - AST, gamma glutamyl transferase GGT, triglycerides, glucose, lactate dehydrogenase - LDH, phosphorus, magnesium, alkaline phosphatase - ALP, total bilirubin, cholesterol, ammonia (NH₃), amylase, lipase, creatine kinase (CK).

Determinations were made by dry chemistry techniques, using the Vetest 8008 device.

Results interpretation was done according to reference values provided by the Department of Biochemistry, School of Veterinary Medicine - University of Teheran [3, 6].

RESULTS AND DISCUSSIONS

The average values of biochemical parameters are shown in Table 1.

Table 1

Average values of biochemical parameters in sturgeon

Assessed parameters	Obtained value (males)	Obtained value (females)	Reference value	
			males	females
BUN	3.5 mg/dl	3.0 mg/dl	3.78 +/- 0.84 mg/dl	3.69 +/- 0.64 mg/dl
Creatinine	0.0 mg/dl	0.0 mg/dl	0.340 +/- 0.060 mg/dl	0.344 +/- 0.048 mg/dl
Uric acid	0.1 mg/dl	0.1 mg/dl	0.03 +/- 0.005 mg/dl	0.02 +/- 0.003 mg/dl
Calcium	8.4 mg/dl	9.4 mg/dl	8.52 +/- 2.76 mg/dl	8.52 +/- 2.76 mg/dl
Total protein	4 g/dl	4.3 g/dl	5.50 +/- 0.94 g/dl	4.51 +/- 1 g/dl
Albumin	1 g/dl	1.5 g/dl	1.26 +/- 0.29 g/dl	1.26 +/- 0.29 g/dl
Globulin	3.2 g/dl	2.9 g/dl	4.50 +/- 0.69 g/dl	3.63 +/- 0.84 g/dl
ALT	100 U/L	139 U/L	100.65 +/- 1.18 U/L	100.65 +/- 1.18 U/L
AST	200 U/L	654 U/L	265.6 +/- 56.55 U/L	265.6 +/- 56.55 U/L
GGT	0.0 U/L	0.0 U/L	0.02 +/- 0.035 U/L	0.02 +/- 0.035 U/L
Triglycerides	450 mg/dl	375 mg/dl	699.6 +/- 22.94 mg/dl	699.6 +/- 22.94 mg/dl
Glucose	100 mg/dl	56 mg/dl	120.54 +/- 26.74 mg/dl	61.62 +/- 15.13 mg/dl
LDH	2100 U/L	2800 U/L	2007.15 +/- 521.97 U/L	2007.15 +/- 521.97 U/L
Phosphorus	12.6 mg/dl	12.4 mg/dl	9.009 +/- 2.07 mg/dl	12.39 +/- 0.267 mg/dl
Magnesium	2 mg/dl	1.89 mg/dl	3.67 +/- 0.85 mg/dl	2.79 +/- 0.63 mg/dl
ALP	100 U/L	244 U/L	69.05 +/- 13.04 U/L	69.05 +/- 13.04 U/L
Total bilirubin	0.1 mg/dl	0.1 mg/dl	0.616 +/- 0.0234 mg/dl	0.616 +/- 0.0234 mg/dl
Cholesterol	100 mg/dl	92 mg/dl	90 +/- 40 mg/dl	90 +/- 40 mg/dl
NH ₃	250 μmol/l	267 μmol/l	300 +/- 170 μmol/l	300 +/- 170 μmol/l
Amylase	0.0 U/L	0.0 U/L	0.001 +/- 0.0003 U/L	0.001 +/- 0.0003 U/L
Lipase	0.0 U/L	0.0 U/L	0.004 +/- 0.001 U/L	0.004 +/- 0.001 U/L
CK	2000 U/L	2036 U/L	2700 +/- 1500 U/L	2700 +/- 1500 U/L

The data shows that males recorded higher values than females for the following parameters: total protein, BUN, uric acid, globulin, magnesium, phosphorus and glucose.

Biochemical parameters for the two sexes (BUN, creatinine, uric acid, calcium, total protein, albumin, globulins, ALT, AST, GGT, triglycerides, carbohydrates, LDH, phosphorus, magnesium, ALP, total bilirubin, cholesterol, NH₃, amylase, lipase, CK) are within the standard limits for acipenserid.

For creatinine, lipase, amylase and GGT could be obtained results, because values were smaller than the detection limits of the kits.

ALT and AST values recorded overvalues in females (ALT = 139 U / L, AST = 654 U / l), while in males the values framing within the normal range (ALT = 100.65 +/- 1.18 U/L, AST = 265.60 +/- 56.55 U/L).

Triglycerides in serum sampled from both sexes were recorded lower values (375mg/dl, respectively 450 mg / dl) than the normal range (699.6 + / - 22, 94 mg / dL). These values may be due to the stress caused by the restraining and blood collection methods.

Glucose, both in males and females, recorded low values (56 mg / dl and 100 mg / dl) compared with normal values (61,62 +/- 15.13 mg/dl in females and 120.54 +/- 27.74 mg/dl in males) which also may be due to the stress and intense muscular activity that fish have suffered before harvesting.

Magnesium recorded slightly lower values (1.89 mg / dl; 2 mg / dl) than the normal limits (2.79 + / - 0.63 mg / dl females and 3.67 + / - 0.85 mg / dl males).

Alkaline phosphatase recorded much higher values for both sexes (244 U/L and respectively 100 U/l) than the normal limits (69.05 +/- 13.04 U/L). This could be caused by the stress they have been exposed, to nutrition or coping problems, considering the fact that some individuals were newly brought for populating the pool.

BUN presented values (3.5 mg / dl; 3 mg / dl) that framing within the reference values for sturgeon obtained from scientific research on the Black Sea sturgeon (3.69 + / - 0.64 mg / dl females and 3.78 + / - 0.84 mg/dl males).

Uric acid recorded values of 0.1 mg / dl which framing within the normal range for sturgeons (0.02 + / - 0.003 mg / dl females and 0.03 + / - 0.005 mg / dl males).

Calcium recorded values (9.4 mg / dl - 8.4 mg / dl) which framing within the normal range for sturgeon (8.52 + / - 2.76 mg / dl).

Total protein recorded values (4.3 g / dl; 4 g / dl) within the normal range for sturgeon (4.51 + / - 1g/dl females and 5.5 + / - 0.94 mg / dl males).

Albumin (1.5 g / dl - 1 g / dl) ranged within the normal values for sturgeon (1.26 + / - 0.29 g / dl).

Globulins in blood samples recorded averages values of 2.9 g / dl, respectively 3.2 g / dl, slightly lower than the admitted limits for sturgeon (3.63 + / - 0.83 g / dl females and 4.5 + / - 0.69 g / dl males).

LDH recorded averages values (2100 U/L; 2800 U/L) corresponding to the reference values for sturgeon (2007.15 + / - 521.97 U / L).

Phosphorus, for both sexes, had averages values (2.4 mg / dl - 2 mg / dl) within the limits for sturgeon (2.79 + / - 0.63 mg / dl).

Total bilirubin recorded values below 0.1 mg / dl, within the standard values for sturgeon (0.616 + / - 0.023 mg / dl).

Cholesterol recorded average values (92 mg / dl; 100 mg / dl) corresponding to the standard for sturgeon (90 + / - 40 mg / dl dL).

Ammonia values of 267 milmol / l, respectively 250 milmol / l were within the reference values for sturgeon (300 + / - 170 milmol / l).

Creatine kinase recorded average values (2000 U / L, respectively 2700 U / L) thus fits into the standard for sturgeon (2700 + / - 1500 U / L)

CONCLUSIONS

- Most biochemical parameters (BUN, creatinine, uric acid, calcium, total protein, albumin, globulins, LDH, GGT, phosphorus, total bilirubin, cholesterol, NH₃, amylase, lipase, CK) have normal values for sturgeon.
- ALT value exceeds the normal limit in female sturgeon specimens by 1.4 times.
- Triglycerides, glucose and magnesium, both in females and males are within the limits.

- Blood biochemical parameters values indicate an medium welfare level in sturgeon.

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