EVALUATION OF BIOLOGICAL INDICATORS OF YOUNG PERSIAN STURGEON (*ACIPENSER PERSICUS*) GROWN AT POND METHOD WITH DIFFERENT ARTIFICIAL FEEDS

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EVALUACIJA BIOLOŠKIH INDIKATORA MLAĐI PERSIJSKE JESETRE (*ACIPENSER PERSICUS*) GAJENE U RIBNJACIMA SA RAZLIČITOM VEŠTAČKOM HRANOM

Apstrakt

Cilj ovih istraživanja je bio da se pomoću bioloških i hematoloških parametara, kao i hemijskog sastava tela proceni rast mlađi persijske jesetre gajene u ribnjacima sa različitom veštačkom hranom.

Istraživanja su obavljena u toku 2102. godine na mretsilištu za jesetre Khylly, Azerbejdžan. Istraživane su larve i mlađ persijske (Kura) jesetre (*Acipenser persicus*), gajene u ribnjacima. U 4 bazena ishrana mlađi je obavljena sa veštačkim starterima za jesetre marke TB strane proizvodnje (opcija I), dok je u 4 preostala bazena mlađ hranjena veštačkom hranom proizvedenom na ribnjaku (opcija II). Persijksa jesetra je gajena u ribnjaku u toku 45 dana.

Količina proteina, masti, pepela i ugljenih hidrata u telu mlađi jesetre koja je hranjena sa različitom hranom (7 individua) je određivana standardnim metodama. Kao indikatori za određivanje fiziološkog statusa mlađi ribe su korišćeni sadržaj hemoglobina i ukupnih proteina u krvi, kao i sedimentacija eritrocita, broj eritrocita i broj leukocita u 1mm^3 krvi.

Ranija istraživanja uzgoja u ribnjačkim bazenima su pokazala da je omogućavanje ishrane organizmima imalo pozitivan efekat na celokupno preživljvanje larvi u toku i posle prelaska na egzogenu ishranu. U toku prelaska na egzogenu ishranu broj uginulih

larvi u svim varijantama eksperimenta nije prevazilazio 4-6%. I 5-6 dana posle prelaska na egzogenu ishranu broj uginulih larvi je bio mali.

Praćenje rasta i preživljavanja larvi persijske jesetre u bazenima su pokazala da je korišćenje naupliusa *A. salina* kao polazne ishrane žive hrane u prvim fazama ishrane veoma povoljno za rast jesetri u bazenima.

Mlađ riba koje su hranjene sa veštačkom hranom stranog proizvođača (opcija I) je pokazivala relativno bolji rast, kao i bolje biološke i hematološke parametre, što je, po našem mišljenju rezultat povoljnijeg hemijskog sastava i sadržaja ove hrane. Analize hemijskog sastava tela persijskih jesetri u čijoj su ishrani korišćene različite hrane takođe pokazuju da kvalitet gajene mlađi riba zavisi od kvalteta korišćene hrane. Uslovi skladištenja, ishrana i koeficijent ishrane takođe imaju veliki uticaj na kvalitet, kao i na vrednosti parametara krvi i hemoglobina kod mlađi riba.

Pozitivna strana uzgoja u ribnjačkim bazenima leži u tome da mlađ ribe raste u potpuno kontrolisanim uslovima i željeni rast eksperimentalnih riba u gustim nasadima i kratkom vremenskom roku može da se ostvari tačnim pridržavanjem pravila za optimalni biotehnološki rast jesetri korišćenjem efektivnih i visoko dostupnih po veličini organizama za ishranu (Mamedov et al., 2009). U tom slučaju, kvalitet mlađi ribe u uzgoju i njen fiziološki status zavise od uslova skladištenja i kvaliteta korišćene hrane.

Ključne reči: persijska (Kura) jesetra, larve, eritrociti, ribnjački metod, biohemijski parametri

Keywords: Persian (Kura) sturgeon, larvae, erythrocyte, pond method, biochemical parameters.

INTRODUCTION

Given the technical capabilities of Khylly Sturgeon Fish Farm at growing of young sturgeons at pond method the feeding of larvae and young beluga (*Huso huso*), Persian (Kura) sturgeon *(Acipenser persicus*) and ship sturgeon (*Acipenser nudiventris)* until they reach 170 mg of sample, and stellate sturgeon (*Acipenser stellatus*) up to 100 mg of sample is exclusively done with live feed. When they reach the above sample (100-170 mg) gradually they are transferred to feeding with artificial feed of factory or foreign production.

The objective of our research was to examine the fish breeding and biological and haematological parameters, as well as the chemical composition of the body of young sturgeon at their growing in different artificial feeds by pool method.

MATERIAL AND METODS

The study was conducted in 2012 at Khylly Sturgeon Fish Farm of Azerbaijan. The larvae and young Persian (Kura) sturgeon *(Acipenser persicus)*, grown by pond method were studied. Persian sturgeon larvae received from one female originally was placed in 4 plastic ponds with an area of 3.14 m^2. The initial placing density of the experimental fish in all ponds was 2.5 thousand individuals /m^2.

Feeding of larvae of Persian sturgeon in all ponds was performed 2-3 days prior to their transition to exogenous feeding. Thus as the live feeds were used only nauplius of *Artemia salina*. Five days after the transfer of larvae to exogenous feeding as live feeds

different size forms of *Daphnia magna,* and chopped and whole *Enchytraeus albidus* were also used. Growing conditions and feeding rate with live feeds of all experimental fish until larvae reaches 170 mg of sample (20 days after hatching) were similar. Then the experimental fish placing density on each pond is halved, resulting in the total number of pond with fish as 8 ponds. From this point the experimental fish gradually are transferred to the feeding with artificial feed. On 4 ponds feeding of fry is performed with artificial starter feed for sturgeon brand of "Starter feed for sturgeon fish", produced by "Raanan Fish Feed Ltd., Israel" (option - I), while the remaining 4 ponds with artificial food of fish farm production (option - II). Daily rate of feeding of the experimental fish in the ponds during growth depending on the growth conditions (temperature, density of placing, age of farmed fish, the type of feed fed) varied from 15-20 to 5-7% of the weight of farmed fish. The period of growth of young Persian sturgeon in the ponds as a whole was 45 days.

Grown young fishes were evaluated on a number of fish breeding and biological, physiological and biochemical parameters. Amount of protein, fat, ash and carbohydrates in the body of the young sturgeon fish grown with different feeds (7 pcs.) was determined by the standard method (Ivanov, 1963; Sklyarov et al., 1984). The content of haemoglobin, total protein and erythrocyte sedimentation rate of blood, red blood cells and white blood cells in 1 mm^3 of blood were taken from the haematological indicators characterizing the physiological status of young fishes.

Ten experimental fish of each age group were sampled. Directly after collecting blood from a tail vein content of hemoglobin and ESR (erythrocyte sedimentation rate) were determinate, and also smear of blood samples were made by classical technique of Romanovsky-Gimza. Hemoglobin content was determined in a hemoglobinometer GF-3, and ESR was studied using the micromethod of G.P.Panchenkova (Musselius et al., 1983). Calculation of blood corpuscles was carried out in chamber of Goryayeva with staining blood cells by neutral read and crystal violet (Ivanova, 1983). 200 leukocyte cells were counted in each test. For differentiation of cells of the red blood 500 erythrocytes of different age groups of experimental fish were counted on smear. Obtained data were processed by the standard methods of the statistical analysis and software package Stadia is used.

RESULTS AND DISCUSSION

It was found that in a ponds method of growing an earlier acquaintance with feed organisms beneficially effects on overall survival of larvae during and after the transition to exogenous feeding. In the period of transition to exogenous feeding the number of dead larvae on all variants of the experiment did not exceed 4-6%. And 5-6 days after the transition to exogenous feeding the number of dead larvae was few.

Monitoring the growth and survival of the Persian sturgeon larvae in the ponds showed that the use of nauplius *A.salina* as starting live feed organisms in the early stages of feeding is a very good element for growing sturgeon in pond. This is explained by the following circumstances: -

- Nauplius of *A.salina* contains 50-55% of protein, and various irreplaceable amino acids, semi unsaturated fatty acids and bioactive compounds (Sorgeloos and Leger, 1992; Van Stappen, 1996; Mikhailova, 2000; Mamedov et al., 2009).
- Nauplius of *A.salina* is small and accessible to prelarvae and larval sturgeon;
- Nauplius of *A.salina* have negative buoyancy when released into the freshwater

conditions and are readily available for actively feeding larvae in the bottom layers and the bottom of the pond without much energetic efforts by them for searching of food (Gershanovich et al., 1987).

In the early stages of development, in the transition from the yolk to the active feeding, deep changes occur in the body of sturgeon larvae related to the preparation for capture, digestion and assimilation of food. This stage is characterized by significant morphophysiological shifts in organs and tissues of farmed fish (Gerbilsky, 1957; Korzhuyev and Sharkova, 1967; Krasnodembskaya, 1990). Inconsistency between the used food and larvae needs at this time leads to starvation, which significantly reduces the growth of young fish and increases the percentage of waste.

After the transition to artificial feeding with different foods some differences were found in the development of the experimental fish. Results of growing of fry and young Persian sturgeon using different artificial feeds (Table 1, 2) are presented in table 3.

Table 1. The composition of foreign starter feed for sturgeon (option - I).

№	Description	Contents
1	Protein	60 %
2	Fat	9,0 %
3	Ash	9,5 %
4	Ca	2,7 %
5	Fibre	0,3 %
6	Vitamin A	30000 i.u /kg
7	Vitamin D_3	3000 i.u /kg
8	Vitamin E	400 i.u /kg
9	Vitamin C	300 i.u /kg
10	P	1,7 %
11	Lysine	4,4 %
12	Methionine + Cysteine	2,5 %
13	Copper	5 mg//kg

Table 2. Artificial food for larvae and young sturgeon of Farm production (option - II).

№	Description	Content, %
1	Fish meal	45
2	Wheat flour	5
3	Fodder yeast (hydrolysis)	20
4	Milk powder	12
5	Oil cake	8
6	Premix	2
7	Fish oil (before pressing + after cooling)	2+6
8	Crude protein,%	48
9	Crude Fat, %	13
10	Ash, %	13
11	Crude fibre, %	0,8
12	Moisture, %	7,7

Table 3. Fish growing and biological indicators of the young Persian sturgeon grown on different artificial feeds

№	Indicators	Option - I	Option - II
1	Weight at start, mg	170,0	170,0
2	Final weight, mg	2050,0	1830,0
3	Period of growing with artificial feed, days	25,0	25,0
4	Survival rate, %	93,0	88,0
5	Fulton condition factor	0,57	0,53
6	Specific growth rate, % per day	10,0	9,9
7	Feeding ratio	1,0	1,2

Young fish used artificial feed of foreign production (option I) was characterized by relatively better fish growing and biological and haematological parameters (table 4, 5), which, in our opinion, due to more rational chemical composition and content of the feed.

The results of analysis of the chemical composition of the body of young Persian sturgeon grown in pond for 45 days with the use of live and artificial feeds are shown in table 4. Analysis of the chemical composition of the body grown at different feeds of young Persian sturgeon also showed that the quality of the farmed young fishes depends on quality of the received feed. Conditions of storing, feeding and ratio of feeding also has a great impact on the quality, the amount of blood and haemoglobin (table 3, 5) of the grown young fish.

Table 4. Comparative characteristics of the chemical composition of the body of young Persian sturgeon grown with different artificial feeds (in % of raw material).

№	Number of fish, pcs	Weight of young fish, mg M ± m	Dry Substance, % M ± m	Protein, % M ± m	Fat,% M ± m	Ash, % M ± m
I	7	2050±150	17,5±0,6	14,5±1,2	0,5±0,03	2,5±0,2
II	7	1830±110	16,4±0,8	13,6±1,3	1,1±0,2	1,7±0,2

Table 5. Fish growing, biological and haematological parameters of young Persian sturgeon grown in pool using different artificial feeds.

Indicators	Options of artificial feeds	
	I	II
Growing period, days (from the time of hatching)	45	45
Body length, mm	71,1	70,1
Body weight, mg	2050±150	1830±110
Haemoglobin, g / l	40,4±2,5	35,9±2,3
Total protein, g / l	19,2±0,5	15,9±0,9
ESR, mm / h	2,4±0,04	2,0±0,04
Erythrocyte, thousand pcs / ml	455,5±39,6	437,5±42,6
Leukocytes, thousand pcs / ml	8,6±0,8	7,4±1,2

Comparative analysis of the obtained results with the combined and pool methods of growing of sturgeon (Golovonenko, 1964; Daudova et al., 2008; Jabarov et al., 1987; Zagrebina and Klimov, 2007) showed that at the observation of above technologies of feeding the young pond grown Persian sturgeon corresponds to the accepted norms in their physiological parameters. However, the best results were obtained with the use of artificial feed produced abroad.

CONCLUSIONS

Our results for growing of young sturgeon using different artificial feeds are important in growing of young fish by pond method. It is the right choice of feed combined with favourable environmental factors ultimately determines the physiological usefulness of young station fish grown in pond.

Positive element in pond growing is that young fishes are grown in fully manned conditions, and the desired growth of the experimental fish at high density placing them in a relatively short period can be achieved by strict observance of the rules of optimal biotechnological growing of sturgeon using effective and highly accessible food organisms in size (Mamedov et al., 2009). In that case, the quality of grown young fish and its physiological usefulness depends on conditions of storing and quality of received feed.

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