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ORIGINAL ARTICLE

RESEARCHES CONSIDERING THE EFFECT OF THE GRADUAL INSERTION OF FODDER IN ALIMENTATION FOR THE GROWTH RHYTHM OF SIBERIAN STURGEON LARVAE (*ACIPENSER BAERII* – BRANDT, 1869) REARED IN SUPERINTENSIVE SYSTEM*

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The experiment was made inside of private sturgeon rearing farm S.C. "Beluga Farm Group" S.R.L. from Calarasi County. The rearing system is flow-through and is emplaced into an enclosure as hall type. Sturgeon larvae were reared in spun glass troughs of a 0.167 m^3 capacity. Experiment duration was 20 days. Biological material, Siberian sturgeon larvae (*Acipenser baerii* – Brandt, 1869), was gained by artificial breeding of breeders imported from Germany. The experiment was going off with two variants and three replications each. The rearing density was the same in both experimental variants, 500 ex/tank respectively. The diet of larvae from each variant was different as follows: in variant I, the larvae were fed exclusively on live diet represented by Tubifex species; in variant II, the larvae were gradually carried over from a diet consisting of Tubifex species to a diet represented only by Perla Larva fodder with a protean content of 62.0 %. On both experimental variants, fed delivery was achieved in the same way, namely the same number of daily intakes, dispensed at the same time. At the end of the experiment, the results were as follows: in variant I, the survival rate was 75 % and the final average body mass of larvae 2.69 g/ex, in variant II, the survival rate was 66 % and the final average body mass 2.38 g/ex.

Keywords: flow-through system, *Acipenser baerii*, larvae, feeding.

1. Introduction

The first trials in sturgeon farming were carried out almost simultaneously in the mid 19th century in Russia, Germany and North America to compensate for the declines in the harvest for wild sturgeon (Williot, 2001).

Now, sturgeon catches recorded on the global level are in decline because of over fishing and degradation of natural the habitat. Concurrently, production of sturgeons presents a special importance for those countries wherein the natural stocks are declined or were disappeared. Currently, some sturgeon species are being considered interesting candidates to produce them in full cycle (Ronyai, 1995).

Because of its plasticity, the Siberian sturgeon the entailed a great attention since the 1940's. Rearing of species on aquaculture started in 1970 years, in former U.S.S.R. At the same time, in France were exported the first exemplars gained from breeders catch in natural environment.

On sturgeon aquaculture, larval rearing is probably the most difficult part of the hatchery process. Fry survival depends on having a proper culture system and a complete nutritional program (Coppens International, 2007).

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The purpose of this paper was to evaluate the capacity of the Siberian sturgeon larvae to adapt to an alimentation based on fodder under rearing conditions of a superintensive flow-through system.

2. Materials and methods

The experiment was made inside of private sturgeon rearing farm S.C. Beluga Farm Group from Calarasi County. The rearing system is flow-through and is emplaced into an enclosure as hall type. Sturgeon larvae have been reared in troughs of spun glass having a capacity of 0.167 m^3.

Water for the system come from Tamadau dam whence it is brought gravitationally into the rearing enclosure. Afore to arrive in the rearing tanks, the water passes through a basin provided with oxygenation system for emergency cases.

Tanks (troughs) for larvae rearing have a rectangular form, fitted with bolters disposed at both ends, perpendicular to bottom surface of troughs in order to maintain the larvae in the middle part of the tank so that larvae can't escape or be annoyed by the water flow.

Water supply of troughs goes through pipes fitted with stop valves, disposed at one extremity of the trough. Discharge of water from troughs is going through across the supplying pipe through another pipe that penetrates vertically the bottom of trough and also determines the level of water inside of trough according to the level that is ascended.

During the experimental period, the water supply debit in troughs was between 0.2 – 3 l/minute and temperature of water oscillated from 16 to 19 ^{0}C.

During the experiment the main quality parameters of technological water (Table 1), were monitored as: pH, dissolved oxygen, total ammonia nitrogen, nitrite, nitrate and hardness.

Table 1. Mean value of physico-chemical parameters of water

Parameters	Variant I	Variant II
pH	7.48	7.54
Dissolved oxygen (mg/l)	5.65	5.12
Ammonia nitrogen (mg/l)	0.024	0.031
Nitrite (mg/l)	0.284	0.345
Nitrate (mg/l)	10.54	11.37
Hardness (dGH)	11.25	11.84

The values of physico-chemical parameters of water ranged within normal limits for rearing of sturgeon larvae. Dissolved oxygen was monitored on WTW oxymeter, pH a WTW pH-meter, and water temperature a thermometer.

The biological material used for experimentations was represented by sturgeon larvae, namely Siberian sturgeon (*Acipenser baerii* – Brandt, 1869), at the age of 21 days post hatch. The experiment was carried out in 20 days. At the beginning of the experiment the average body mass of larvae was 0.16 g/ex.

During the experiment, larvae were fed (Table 2) on live diet, represented by worms (*Tubifex sp.*) as well as with Perla Larva fodder.

Table 2. Biochemical structure of delivered feed

Diet	Humidity, g %	Crude protein, g %	Lipids, g %	Ash, g %
Perla Larvae fodder	9.00	62.00	11.00	10.00
Tubifex	80.00	10.50	2.86	1.50

The experiment was carried out in two variants with three replications each:

- variant I – the larvae were fed exclusively on a live diet represented by grinded worms. At the end of the experiment, survival rate was 75 %, and the final average body mass of larvae 2.69 g/ex.
- variant II – the Siberian sturgeon larvae were fed on both worms and Perla Larva fodder.

Alimentation of larvae has been amended gradually from feeding exclusively on worms (until the age of 25 days post hatch) to feeding exclusively on fodder for the last days of the experiment (until 40 days post hatch). At the end of the experiment, the survival rate was of 66 %, and the final average body mass of larvae was of 2.38 g/ex.

The technical conditions for rearing were identical for both experimental variants: the same type of tanks for rearing of larvae (troughs), the same water supply debit values of 0.2 – 3 l/minute and the same rearing density (500 ex/tank).

In both experimental variants, delivery of feed was carried out in the same way, namely the same number of daily feedings; delivered at the same time for all variants. Daily ration of feed was gradually changed according to the feeding intensity of larvae.

During the 20 days of experiment, to determine the growth rate of the biological material, the range of 5 days have been taken as many as 60 larvae of each experimental variant for the purpose of the biometric measurements.

In order to determine the growth rate of the biological material, every 5 days we made biometric measurements by sampling as many as 60 larvae of each experimental variant.

For weighing larvae has been used an electronic analytical balance KERN ALJ 220-4NM. For drawing diagrams in the paper, the program Microsoft Office-Excel 2003 has been used.

3. Results and Discussion

At the end of the experiment some differences were enlisted between the experimental variants, reflected on the average body mass, the growth rate, the specific growth rate and the survival rate.

In table 3 it can be observed the best growth rate of the Siberian sturgeon larvae recorded in the variant I, in which the larvae have been fed only on worms. In variant II, in which the larvae have been fed on both worms and fodder, the average body mass of larvae has been by 11.5 % lower than in variant I. Also, in variant II, the survival rate of the larvae has been by 12 % lower than in variant I.

Table 3. Biotechnological indexes

Age, days	Average body weight, g/ex		Average body length, mm	
	Variant I	Variant II	Variant I	Variant II
21	0.16	0.16	27.5	27.5
25	0.50	0.50	32.0	32.0
30	0.92	0.86	45.5	43.0
35	1.49	1.28	64.2	61.5
40	2.69	2.38	78.5	74.0

The survival rate of the larvae was determined by the end of the experiment by counting larvae of the two experimental variants.

In order to assess the gained results in both experimental variants, it was drafted the chart of daily growth rate (Figure 1) of Siberian sturgeon larvae.

The results show that in both experimental variants, the specific growth rates of larvae (Figure 2) describe an initial decline, after which, at the age of 35 days, the curve follows an ascendant path.

This is primarily due to the fact that the larvae have need a certain time period to adapt to the type of feed delivered. This situation was also mentioned by other authors (Koksal, 2000; Palteanu, 2003) on sturgeon rearing in different growing systems and different density formulas.

The specific growth rate was determined on the base of the formula:

$$SGR = \frac{\ln w_t - \ln w_0}{t} \times 100\ ;$$

where: w_0 and w_t – initial and final mass; t – time period.

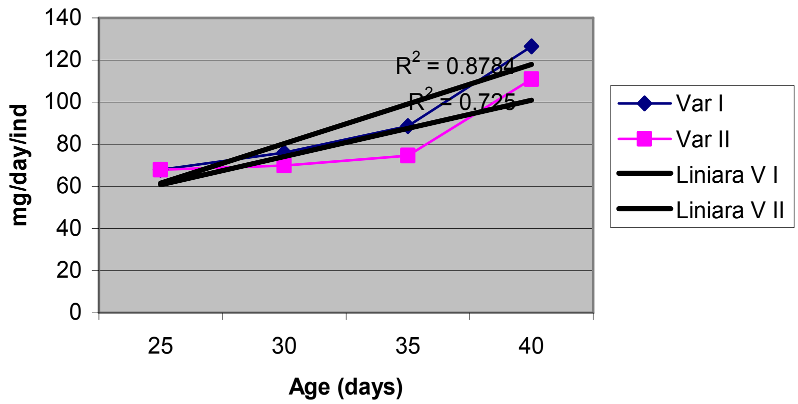

Figure 1. Chart of daily growth rate

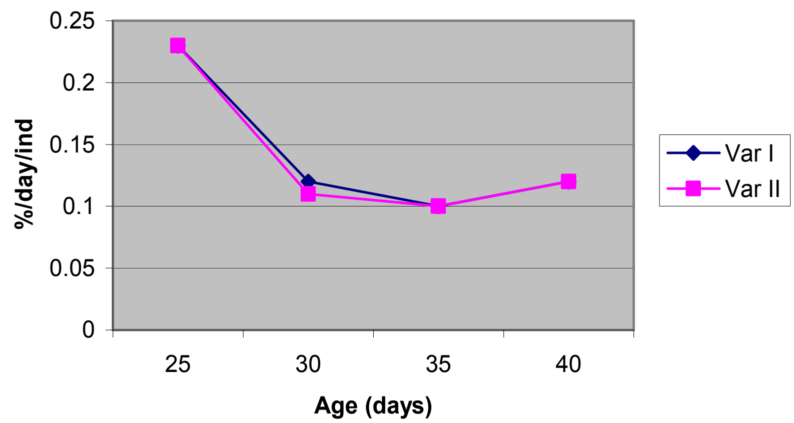

Figure 2. Chart of specific growth rate

4. Conclusions

The results from this experiment indicate that in normal growing conditions, the larvae of the Siberian sturgeon can adapt well enough to feeding on fodder, if its introduction in food is made gradually.

By delivering in a mixture of live feed and fodder, the latter was better accepted by the larvae since the first day of it being used.

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