PRELIMINARY RESULTS ON THE INFLUENCE OF THE QUALITY OF FEED ON GROWTH PERFORMANCE SPECIES *POLYODON SPATHULA* (WALBAUM 1792) THE CONDITIONS OF A RECIRCULATING SYSTEM

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Abstract

The paper presents aspects of assessing the influence of food quality on growth of juvenile Polyodon spathula (Walbaum, 1792), in a recirculating system. Researches were conducted between 01.09-07.10. 2010 pilot laboratory of Department of Aquaculture, Environmental Science and Cadastre of the Faculty of Food Science and Engineering. Experimental system consists in four units of growth with a volume of 0.30 m^3 each. The first version was tested on a feed with 54% crude protein (Aller Performa) and the second feed with 41% crude protein (Extra Classic 1P). The biological material was represented by juveniles aged 112 days. They tested two storage densities: in variant 1 - A1 and A3 units-2.81 kg/m3, and the alternative A2 and A4 two-units-3.25 kg/m^3.

At the end of the experiment were obtained average body mass of 80 g and 75 g in variant 1 and 100 g and 101 g in version 2. Specific growth rate (SGR) varied as follows: A1-0.77 g% / day, 0.95 g% A3 / day; A2-0.98 g% / day, A4% -1.02 g / day. Feed conversion factor (FCR) was 2.62 and 2.12 g feed / g gain biomass in V1, respectively 2.06 and 1.99 g feed / g gain biomass in V2. Technological indicators have shown that by changing feed quality, fish growth was positively influenced. Paddlefish spathula (Walbaum 1792) is a sturgeon with a moderate rate of growth, it is possible to obtain an increase of biomass, using granules with 41% crude protein.

Keywords: paddlefish, recirculating system, biochemical composition, FCR, SGR

INTRODUCTION

Romania has the largest breeding group of paddlefish in Europe. Based on popular material produced by the artificial reproductive Centre of Rechearches and Development of Aquaculture Nucet, important to obtain national production [1]. The paddlefish propensity consume planktonic organisms. In the wild, the main food consists of zooplankton, fish always swimming with his mouth wide open, filtering water through the thorns as gill [2].

Purkett (1963) has experienced for the first time, the artificial feeding of juvenile paddlefish. He used a starter feed which is normally dedicated to trout. The results were not encouraging, registering a very high mortality [3]. The same results were obtained and Russell (1982) to test a specific feed for salmon farming [4].

The literature recommended that the feed should remain as long as the water mass fish is able to eat them before they fall on the bottom. In terms of protein concentration in the feed, it is recommended that the protein needed for sturgeon is not less than 40% [5, 6]

Industrial recirculating aquaculture systems is an important alternative to the traditional one based on keeping fish in ponds. Water quality in a recirculating system depends largely on the amount of dissolved oxygen, carbon dioxide concentration and nitrogen compounds [7].

MATERIAL AND METHOD

The experiment was conducted during the period 01/09 to 07/10/2010 in the pilot laboratory of Department of Aquaculture, Environmental Sciences and Cadastre, Faculty of Food Science and Engineering. Recirculating fish farming system consists in four units of type aquarium net volume increase of 300 L and the dimensions of 100x80x40 cm. The unit is equipped with mechanical and biological filtration, sterilization unit (UV-C equipment 35,000 Tetra Quiet, power 36 W), aeration (compressor Resun Quiet LP-100 with 100 w power, pressure and flow of 0.045 MPa air 150 L / min.) (Figure 1). Temperature and dissolved oxygen, the main physico-chemical water parameters were measured daily with a Hach-Lange equipment Sc 1000. Nitrogen compounds ($N\text{-}NO_2^-$, $N\text{-}NO_3^-$, $N\text{-}NH_4^-$) were determined periodically Spectroquant Nova 400 type spectrophotometer, using kits, compatible, Merk.

Recirculating system ensures a flow of 12 L / min / unit growth.

Figure 1- Breeding of pilot research laboratory

Aquaria were stocked with juvenile paddlefish aged 112 days, from the Centre of Rechearches and Development of Aquaculture Nucet [8]. The popular, juveniles had a mean weight 57.93 g and an average total length of 26.13 cm. During the experiment, tested two types of pelleted feed: Aller-performance, 54% crude protein, respectively 1P Extra Classic, with 41% crude protein. Daily ration during the experiment was 2%. Meal frequency was 6 meals per day and there were used nutritious low-capacity machines. The main chemical characteristics of the two types of feed are presented in Table 1. Two experimental variants were designed, in duplicate, each being assigned to two units of growth for each variant (V1 - A1 and A3 V2 - A2 and A4).

Resulting values were processed Microsoft Office Excel.

Table 1. Chemical composition of feed used in experiment

	Classic Extra 1 P	***Aller Performa***
Composition	Quantity	
Protein	41%	54%
Fat	12%	15%
Ash	6,5%	10.8
Fiber Assay	2,5%	0.5%
P	0,85%	1.7%
Vitamin A	10000U.I/kg	10000 U.I/kg
Vitamin D3	1250 U.I /kg	8000 U.I/kg
Vitamin E	150 mg/kg	300 mg/kg

RESULTS AND DISCUSSION

Technological performance indicators obtained in the experiments are presented in Table 2. In both experimental variants, V1 (A1 and A3 tanks) and V2 (tanks A2 and A4), gains were achieved satisfactory growth. Densities of biological material at the beginning of the experiment was 2.81 kg/m3 in the first variant (A1, A3) and 3.25 kg/m3 in the second variant (A2, A4). At the end of the experiment the average density of crop biomass was 3.86 kg/m3 V1 and V 2 of 4.7 kg/m3. In terms of survival of 100% in A3, the rest of breeding were recorded mortality, survival was 87.5% in both the A1 and in V2 (A2 and A4) (Table 2). In variant V2, the quantity of food was distributed with a protein content lower than V1, it has been observed that the increase was greater growth.

Mean values for each variable indicates an increase of fish biomass of 1.05 kg/m3 and 1.5 kg/m3 in V1 in V2. Growth rate (GR) technology indicator showing linear growth of the fish, virtually constant, ranged from 7.49 to 9.62 g / day (V1) and from 11.57 to 12.03 g / day (V2).

Comparing the index of feed conversion (FCR) in both experimental variants shows that the first version was a higher value (2.37) than the second version (2.02). Specific growth rate (SGR) shows higher values in the second variant (0.98 g% / day and 1.02 g% A2 / A4 day) than the first version (0.77 g% / day in A1 and 0.95 g% / day in A3) (Figure 2).

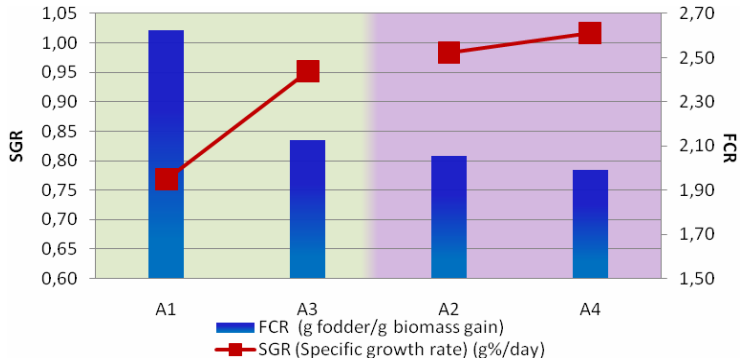

Figure 2. Evolution of feed conversion ratio (FCR) and specific growth rate (SGR) during the experiment

Table 2 Technology Performance Indicators juvenile paddlefish raised in recirculating system

Experimental variant	**V1**			**V2**		
Indicatorul/bazinul	**A1**	**A3**	**Mean**	**Mean**	**A2**	**A4**
Initial biomass (g)	843	844	843,5	974,5	975	974
Initial biomass (kg/m^3)	2,81	2,81	2,81	3,25	3,25	3,25
Final biomass (g)	1120	1200	1160,0	1411,0	1403	1419
Final biomass (kg/m^3)	3,73	4,00	3,86	4,70	4,67	4,73
Biomass gain (g)	277	356	316,5	436,5	428	445
Biomass gain (kg/m^3)	0,92	1,19	1,05	1,5	1,43	1,48
Initial number fish	16	16	16	16	16	16
Final number fish	14	16	15	14	14	14
Survival (%)	87,5	100,0	93,8	87,5	87,5	87,5
Initial mean body weight (g/ex)	52,7	52,8	52,72	60,9	60,9	60,9
Final mean body weight (g/ex)	80,0	75,0	77,50	100,8	100,2	101,4
Number of days	37	37	37	37	37	37
Individual body weight gain (g)	17,3	22,3	19,78	27,3	26,8	27,8
GR (growth rate) (g/day)	7,49	9,62	8,55	11,8	11,57	12,03
SGR (Specific growth rate) (g%/day)	0,77	0,95	0,86	1,0	0,98	1,02
Total feed distributed (g)	726	756	741	882,6	880	885
FCR (g fodder/g biomass gain)	2,62	2,12	2,37	2,02	2,06	1,99
Feeding level (g/kg met weight.)	20	20	20	24	24	24
Feeding level (% biomass)	2,0	2,0	2,0	2,0	2,0	2,0
Crude protein (PB-%)	54,0	54,0	54	41	41,0	41,0

Determination of body mass correlation (g)-total length (cm) (W-TL), was performed for each variant at the beginning and end of the experiment, applying the formula:

$W = a \cdot TL^{B,}$

V2: Main weight= $0.0015 \cdot Lenght^{3.215}$

Main weight=$0.00070 \cdot Lenght^{3,456}$,

V1:Main weight = $0.0034 \cdot Lenght^{2,958}$,

Main weight = 0.0001 x $Lenght^{3,848}$

Correlations between length and average individual weight of each variant are shown in Figures 3 and 4, are observed directly proportional dependence, revealing slightly more homogeneous populations than in V1, V2, correlation coefficients were very good at harvest: V1: R2 = 0.90, respectively V2: R2 = 0.94. This demonstrates that when given a feed with a protein concentration of 41%, the difference between plus and minus variants variants in a population is higher than with a feed with a protein level of 54%.

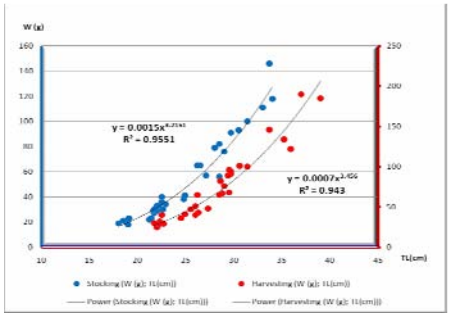

Fig.3. Length-weight regression in version V1

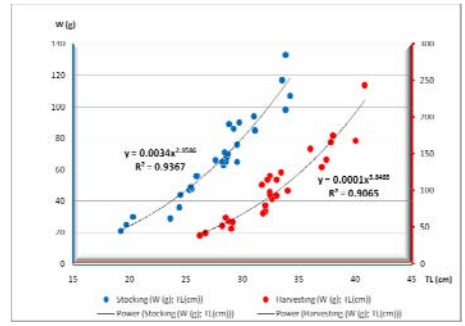

Fig.4. Length-weight regression in version V2

Optimum temperature for growth is between values sturgeon 20-26^{0}C [8.9]. It is noted that during the experiment, temperature ranged between 20.3-25.4^{0}C limits, optimal growth of crop species, while oxygen varied between the limits 8.32 - 9. 83 mg·L^{-1}, values that are also considered optimal for sturgeon, pH also has normal variations throughout the experiment, with values falling within the optimal range of 7.30 - 7.78 pH units (Figure 5). Ammonium ion showed growth optimum for sturgeon, ranging from 0.06 to 0.44 mg L^{-1}.

Nitrite values ranged between 0.02 to 0.4 mg·L^{-1}.The amount of nitrate in the experimental period recorded in the two variants of growth ranged from 5.7 mg·L^{-1} and 13.75 mg·L^{-1}, with an average of 9.72 mg·L^{-1} (Figure 6).

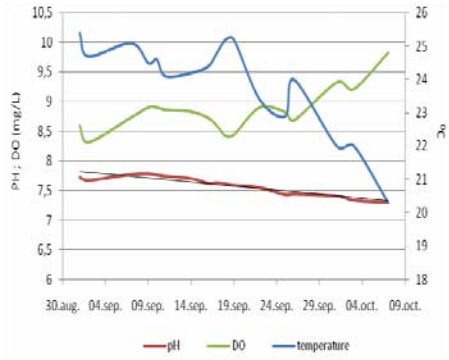

Figure 5. Variation of water main parameters

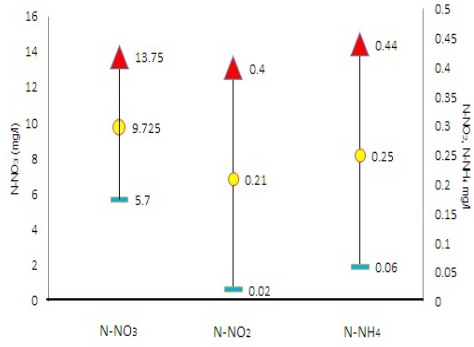

Figure 6. Changes in nitrogen compounds

CONCLUSIONS

During the experiment, fish were continuously active behavior, consuming food administered in the form of granules. Under a recirculating aquaculture system, juvenile paddlefish has a moderate growth rate. The feed protein concentration, 41%, proved to be more effective, registering an increase of biomass better than the version of the feed had a 54% crude protein. The experiment confirmed the data in the literature that the optimal protein concentration required to raise juvenile paddlefish lies around 40%.

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