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Growth performance and food conversion ratio of Persian sturgeon (Acipenser persicus) at different level of dietary protein

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***Abstract*—*Acipenser persicus* is an endemic fish of Caspian Sea and dispersed in south of this sea. This species has especial place in Iran meat and caviar production. In this research have been conducted an 8-week experiment on Acipenser persicus fingerlings with an initial weight of 1.1± 0.06 g (mean ± SE, n=35) to determine the best protein level dietary requirements that caused suitable growth performance and food conversion ratio for hatchery-produced juvenile of Persian sturgeon. Fingerlings were fed with three level of dietary protein (45%, 50% & 55%). Protein of these diets supplied with graded amounts of protein mixture. Analysis variance showed that protein requirement of Persian sturgeon juvenile was 50 %. Specific Growth Rate, Food Conversion Ratio, Food Efficiency, survival, Body Weight Increase and final weight showed significant difference in protein level of 50 % with two other levels (P<0.05). Coefficient of Food did not showed any significant difference in these three levels (P<0.05). Based on these results, 50% dietary crude protein from a good quality source recommended for the optimum Growth performance of Persian sturgeon in early age of life.**

Keywords-Protein Requirement, Persian Sturgeon, Food Conversion Ratio, Growth Rate

I. INTRODUCTION

Acipenser persicus is from Acsipenseridae family that is dispersed in south of Caspian sea and migrate to some rivers like Sefid rood, Koora, Tajan, Sorkh rood and Gorgan for spawning .

Presently this species cultured in Iran with live food just for preserve and restoring the remained of this species. It has the main part of fishing and producing Caviar in Iran and its Caviar is very important in world market. So attention to this species is very important in Caviar exporting for Iran. According to decreasing this fish stocks it is better to do commercial culture that need information about its condition and food requirements .

Culture of Acipenseridae in Iran has done recently and first time had done by Yousefpour in 1990 and from 1995 has done by Acipenseridae International Researching Institute (AIRI), but there ate some problems about its food requirement and cultural conditions, yet .

Protein is the main and most expensive part of their food composition and has 40-70 percent of food cost in culturing [11]. Fishes like *Acipenser persicus* need a high level of protein in their food for growth (33-55%) [8, 9]. So determination of protein requirement for more growth of Acipenseridae especially in first levels of growth should be useful so much [2]. There is no more studies about them and most information is about Siberian sturgeon [5, 9] and White sturgeon [1, 4, 5, 12] and there is no more information about protein requirement of other species. Therefore, the main purpose of this study is determination of best protein level for *Acipenser persicus*.

II. MATERIALS AND METHODS

In this survey three food ration with three level of protein dietary (45, 50, 55%) were supplied. Formulation of food ration and their chemical composition have been shown in tables 1 and 2. Experiment was done in eight weeks in aquaculture farm of Shahid Marjani in Aghghala, Gorgan, Iran. For this purpose 1.10 g fingerlings are stored in Veniro tank measured 0.6*1.0*0.9 meters with population density of 35 fingerlings in every tank and permanent current with exit water speed 1.7 $Lmin^{-1}$, and were fed basis of 10% of their body weight. Along the experiment the temperature was 22±1°C. Fishes are weighed by digital scale and measured by biometry board every 10 days. finally their growth efficiency calculated basis of Specific Growth Rate, Food Conversion Ratio, Food Efficiency and Body Weight Increase and Coefficient of Food, by below equation.

$$SGR = [(Lnw_f)-(Lnw_i) / \Delta t]* 100 \quad (1)$$

That: w_f= Final weigh

w_i= First weigh

Δt= Period of experiment [3]

$$FCR = \text{Consumed food (Kg)} / \text{Achieved biomass } (\overline{w}_t - \overline{w}_0) \quad (2)$$

$$FE = \text{Achieved biomass (Kg)} / \text{Consumed food (Kg)} \quad (3)$$

$$BWI\% = 100* (BW_f - BW_i)/BW_i \quad (4)$$

That: BW_f= Average of final weigh

BW_i= Average of first weigh in every tank

$$CF(K) = W/L^3*100 \quad (5)$$

That: W= Weigh

L= Long

This survey was done basis of completely randomized design and comparison of means was performed using least significant differences (LSD) (p= 0.05), by the SPSS statistical package, 15 evaluation version.

III. RESULTS

The fig 1 (a to f) one after the other expressed specific growth rate, food conversion ratio, food efficiency, body weigh increase, coefficient of food and survival in different treatments.

Comparing the averages shown that after eight weeks surveying in fishes that feed with 50.0% protein content dietary , there is significant difference in specific growth rate (SGR), food conversion ratio (FCR), food efficiency (FE), body weigh increase (BWI) comparing with the fishes that feed by two other protein content dietary 45.0%, 55.0% ($p<0.05$) but coefficient of food had no significant difference.

The best final weigh and SGR, FCR and FE achieve by fishes that feed with 50.0% protein content dietary. Specific growth rate from 1.6 in treatment 1 (with protein content dietary 45.0%) until 2.66 in treatment 2 (with protein content dietary 50.0%) was different. Food efficiency with significant difference was better when fishes feed with low protein level dietary until 34.66 while fishes feed with high protein level dietary. FCR in fishes that were fed with 50.0% protein content dietary was lower than the two other treatments.

Food efficiency is also higher in 50% protein content dietary ,although the more survived was in 55% protein and the two other protein levels has no more significant difference in survival. Food composition analysis in all three treatments was shown in table 2.

TABLE I. Component and composition of food portion consumed

Food Kinds	Treatment		
	1	2	3
Fish Flour	**50.00**	**56.00**	**65.50**
Wheat Gluten	**4.00**	**6.00**	**5.00**
Yeast	**4.00**	**5.20**	**5.00**
Soybean Pressed Seed	**6.50**	**5.00**	**4.00**
Dry Milk	**4.00**	**4.00**	**3.00**
Wheat Flour	**3.00**	**2.00**	**1.00**
Corn Flour	**10.50**	**4.00**	**-**
Oil Mixture	**12.00**	**12.00**	**12.00**
Molasses	**1.00**	**1.00**	**-**
Supplementary	**1.50**	**1.50**	**1.50**
Lysine	**1.50**	**1.50**	**0.80**
Chalk	**0.40**	**0.40**	**1.00**

TABLE II., Chemical composition of food protein

Treatment	Moisture	Crude Protein	Crude Lipid	Ash
1	10.50	45.21	16.86	**8.05**
2	8.20	50.06	17.20	**9.75**
3	**11.50**	**55.09**	**16.93**	**7.10**

IV. DISCUSSION

Acipenser persicus is an endemic species of Caspian Sea and disturbed in south of it. It has special place in producing of meat and Caviar in Iran. There is no more information about this species especially in cultural condition and it is a limited factor for developing culture of Acipenseridae [5]. Protein is costly composition in feeding fishes because fishes usually need high quality protein level and lack of protein has bad effect in animal's growth [7].

So having information about protein requirement of *Acipenser* persicus fingerlings is very important in developing its culture.

Studies have shown that protein requirement of Acipenseridae is at least between 36.50 to 40.50 percent [5]. In this survey determined that protein requirement of food portion of *Acipenser persicus* fingerlings is 50.0%, that is same as with protein requirement of White sturgeon and Siberian sturgeon that are 49.0 and 50.0% for maximum growth [5].

In similar studies In eight week experiment for determination protein requirements of white sturgeon fingerlings were fed with eight dietary with protein content of 20 up to 52.7 percent increasing body weight have reached in 50.0% protein content [5], that this protein content is same as 50.0% that we found in *Acipenser persicus* fingerlings.

The results shown that the 50% protein content has the best growth and FCR for *Acipenser persicus* fingerlings. Also experiments shown that increasing protein from 45.0 to 50.0% caused increasing growth and food efficiency, specific growth rate and Food Conversion Ratio that the same result was determined in flounder fish with increasing protein level from 40.0% to 50.0% [3].

Kozolov (1993) and Shevchenko (1995) have reported protein requirement for *Acipenser persicus* was 42.8% that this difference could be because of the quality of protein that consumed [5], that in this study we determined it 50% for fingerlings.

Growth and food efficiency in feeding fishes is two main economical factors that determined commercial produce. In this survey we have the maximum food efficiency in 50% protein level. Also Hung (1989) had expressed the rapid growth and high food efficiency of White sturgeon in cultural condition [4].

So with care of our experimental condition we determined the protein requirement of *Acipenser persicus* fingerlings about 50% for maximum growth efficiency and best food conversion ratio.

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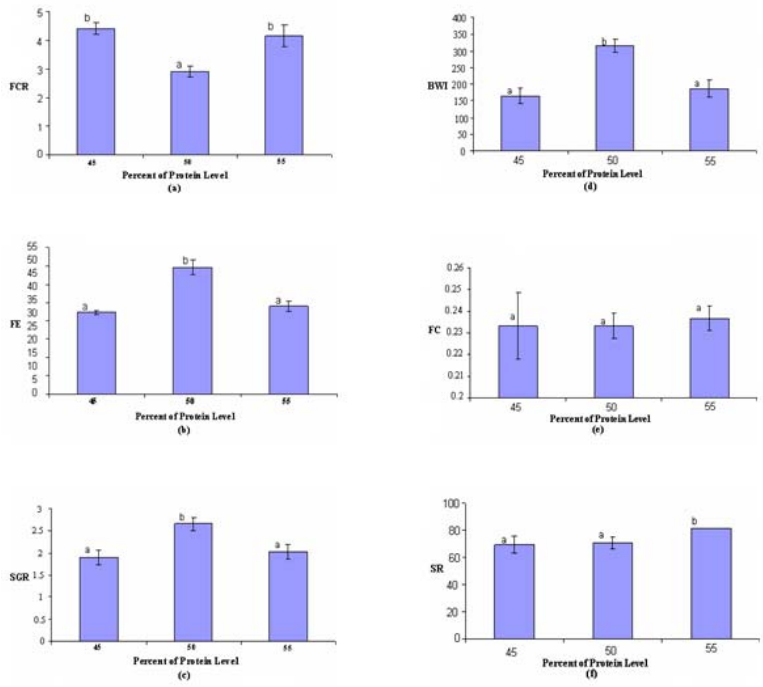

Figure 1. Growth performance and food conversion ratio of Persian sturgeon at in different protein levels of food portions; (a) Food conversion ratio, (b) Food efficiency ratio, (c) Specific growth rate ratio, (d) Body weight increase ratio, (e) Fat coefficient ratio, (f) Survival rate

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