PROTEIN REQUIREMENTS OF (*BARBUS* (*SHARPEYI* GÜNTHER.1874*)* FINGERLINGS

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Abstract: The protein requirements of Barbus sharpeyi (Günther.1874) fingerlings with an initial body weight of 5.5 gram on the average, were studied by using four diets containing 32, 36, 40 and 44% crude protein, and fed for 90 days.

The best growth performance was obtained with (36%) crude protein and carbohydrate (35%), followed by the diets containing 40, 44 and (32%) crude protein respectively. Protein efficiency ratio was decreased with increasing dietary protein levels. Body protein was increased with increasing dietary protein levels up to 44%. There were an inverse relationship between the body moisture and lipid content. From the economical point of view, the highest net return of investitment, production of pound and production of each gram of diets was in group of fish fed on the diet containing 36% crude protein. In conclusion, the optimum protein level for *Barbus sharpeyi* (**Günther.1874)** weighing 5.5 gram fingerling was 36% crude protein

Introduction:

The economic success of controlled production of fish depends mainly on the cost of feed and particularly on that of protein, as protein is the most expensive component in artificial diets of fish. Knowledge of the protein requirement is essential in formulation of well-balance and low cost artificial diets(**Papoutsologlou and Alexis,1986 ; Salman, 2000)**

The dietary protein requirements of several species of young fish have been reviewed **(NRC, 1983; 1993, El-Dahhar, 2000a,b).**

Although members of the cyprindae are widely distributed in Iraq and much attention has been given to their controlled mass production, However only a few studies on the formulation of suitable artificial diets have been reported **(Albertini-berhaut, 1974; Papoutsoglou and Alexis, 1986).** In spite of these studies, the picture is still not clear and the dietary protein requirements of *Barbus sharpeyi***(Günther.1874)** inadequate, so more studies are required.

The present study was undertaken to determine the quantitative protein requirements of fingerlings *Barbus sharpeyi***(Günther.1874**).

Materials and Methods

Culture condition:

360 fingerlings *Barbus sharpeyi* **(Günther.1874)** were collected from a wild population in Hatchery fish Marine Science Centre weighting in average 5.5 gm. They were randomly distributed in 12 circular tanks (200 liters) 25 fish in each in the lab. Sixty fish were taken and subjected to proximate analysis by standard methods (**AOAC, 1980).** The water temperature was maintained at 24 $\pm$ 1^{o}C by a 250-watt immersion heater with thermostats in each tank. The salinity was 14 ppt. All tanks were continuously aerated by air pump. One third of water was changed every day. Fish were acclimatized to the experimental condition for two weeks prior to the experiment. The experimental period lasted for 90 days (from 22/12/2009 to 22/3/2010). All fish in each tank were weighed every 10 days. The temperature, Oxygen and salinity were measured daily by oxygen temperature meter (Mettles Toledo, model 128 1242) and salinity meter,(model Bridge M.C.S.).The pH and Ammonia were measured every two days by pH meter and Ammonia meter (Hanna ammonia meter)‹**(Jobling,1993)** The average water quality criteria of all tanks are presented in **Table 1.**

Diet and feeding regime:

The experiment was undertaken at Fish Research Lab at College of Agriculture, Department of Fisheries and Marine resources. Four caloric diets containing 32, 36, 40.and 44% crude protein were formulated (**Table 2)**. Dry ingredients were passed through screen (0.6 mm diameter hole) before mixing into the diets. Mixtures were homogenized in a feed mixer model SNFGA (kitchen aid st. Joseph, M 149085). Boiling water was then blended to the mixtures at the rate of 50% for pelleting. An autoclave was used to heat the diets

for 20 min after adding boiling water using a maximum pressure of 1.2 kg/cm2G. Vitamins and minerals mixture 4% exogenous zymogene were added to the diet after cooling to room treatment. The diets were pelleted using meat grinder of kitchen aid with a 1.5 mm diameter and kept backing frozen until they used.

The experimental diets were fed a rate 3% of the fish biomass per day. The daily amount of food was offered two times at 9.00 am and 3.00 p.m, and the amounts of diets were readjusted after each weighing. The experimental diets were analyzed for moisture, protein, ash, fat and fiber by standard methods **(AOAC, 1990)**.

The composition and proximate analysis of the diets are given in **Table 2.** The parameters chosen for the evaluation of the experimental diets were weight gain, Feed Conversion Ratio(FCR), Specific Growth Rate (SGR) and Feed Efficiency (FE). .

Analytical Methods

At the end of the experiment, sample of 10 fish from each treatment were taken randomly within average weight and dried at 70^0C for 48-72 h and passed through a meat grinder into one composite homogenate per group. Content of homogenized fish was analyzed according to the methods of (**AOAC, 1990).**

Statistical Analysis

Statistical Analysis was carried out using MSTAT program version 4 (1987). Significant differences among the mean of different treatment were compared by using by Duncan's multiple range test **(Duncan, 1955).**

Results and discussion

The growth performance of *Barbus sharpeyi***(Günther.1874)** fingerlings fed different protein levels are shown in **Table 3**. Diet 2 which contained 36% crude protein gave significantly **(P<0.05)** the highest weight gain, specific growth rate **(SGR),** protein efficiency ratio (PER) and feed efficiency **(FE)** than the group of fish fed on diets containing 40, 44 and 32% crude protein respectively. The best food conversion ratio **(FCR)** was recorded in group of fish fed diet containing 36% crude protein than the rest of experimental groups.

Final mean weight and SGR increased as the dietary protein level increased from 32 to 36% crude protein, and decrease at higher protein levels. This response to increasing protein levels is similar to that reported for grass carp fry **(Dabrowski, 2005; Ogino, 1980),** eel*(Angilla japonica)* **(Nose and Arai, 1972)** and tilapia,*Ctenopharygondon idellaand ,ypophthalmichthys molitri*x **(Jauncey, 1982 ;Saleh, 2005))** and conferms with the general pattern observed for high quality proteins **(Harper, 1965).** Group receiving diet containing 36% crude protein had also the highest food consumption, a decrease being apparent for higher and lower protein levels, which in agreement with(**De Silva and Perera ,1976)** for *M. cephalus*. L.

Average protein efficiency ratios **(PER)** values for the experimental diets are presented in **Table 3**. Generally PER decreased with increasing dietary crude protein level up to 44% as has been noted in *S. mossambicus* **(Jauncey, 1982);** *O. niloticus* **(Siddiqui** *et al***., 1988 and Eid** *et al.,* **2003)** and other fish species **(Ogino and Saito, 1970).** The concentration of dietary protein had performed effect on muscle composition of fish **(Table 4).**There was a

significant ($p<0.05$) increase in muscle protein content with increasing dietary protein level. Similarly,**(Yuikowski,m. and Tabachek,J.(1978)** fish fed high-protein diets tended to have lower muscle lipid content. Similar results concerning the effect of dietary protein in carcass composition has been observed on other studies with common carp **(Zitter** *et al*.**, 2003)**, plaice (**Cowey** *et al*.**, 1972**)**,** young grey mullet **(Papoutsologlou., 1986;Eid** *et al*.**, 2003).** The ash content was unaffected by different dietary protein levels, as has been reported with other fish species **(Ogino, and Saito, 1970; Dabroski, 1979; Al-dbekl 1996;Ogino, 1980; Jauncey, 1982; Siddiqui** *et al*.**, 1988 ; Eid** *et al*.**, 2003)** .

There were an inverse relationship between the body moister and lipid content, which is in agree ment with **(Jauncey, 1982; Eid** *et al*.**, 2003).**

Economic Efficiency:

Table 5: Shows the results of economical evaluation including the costs and income.

Total cost were found to be 32.0, 34.83, 34.88 and 34.84 lraqi dinars(l.D) for the groups of fish received diets containing 32, 36, 40 and 44% crude protein respectively. These results revealed that the total costs of 40% crude protein were higher 34.88 lraqi dinars than the other groups. On the other hand, the total costs of (32%) crude protein were lowest 32.00 lraqi dinars (l.D) due to the cost of feed ingredient. Net return in dinars were 8.00, 31.17, 17.62 and 17.66 lraqi dinars (l.D) for the group of fish received diets containing 32, 36, 40 and 44% crude protein respectively. Percentage of net return to total costs for treatment cited above were 25, 89, 50 and 51% respectively, indicating that

the highest net return of investment were obtained with the group of fish received diet containing 36% crude protein. The productivity of each gram of diet were 0.38, 0.56, 0.48 and 0.43g for the groups of fish received diets containing32, 36, 40 and (44%) crude protein respectively. From the economical point of view, results suggest that the protein level of (36%) for *Barbus sharpeyi* **(Günther.1874)** fingerlings weighing 5.5g is recommended to achieve the highest percentage of net returns to total costs. In conclusion, the optimum dietary protein level for *Barbus sharpeyi* (**Günther.1874)** fingerlings weighing 5.5g was (36%) crude protein.

Table (1): Average water quality criteria of experimental tanks used in the experiment.

Temperature ^{0}C	**24+ 1**
Oxygen (mg/L)	**5**
Ammonia NH3, (mg/L)	**0.001**
pH	**7.00**
Salinity (ppt)	**14.00**

Table (2): Composition and proximate analysis of experimental diets

Ingredient	**Protein level (%)**			
	32	**36**	**40**	**44**
Fish meal (70%)	**26**	**33**	**34**	**40**
Soybean meal (44%)	**26**	**23**	**32**	**34**
Yellow corn	**44**	**37**	**27**	**19**
Fish oil	**2**	**2**	**2**	**2**

Corn oil	**3**	**3**	**3**	**3**
Mineral Mix.[1]	**1**	**1**	**1**	**1**
Vitamin mix. [1]	**1**	**1**	**1**	**1**
Proximate analysis(%)				
Moisture	**7.30**	**7.40**	**7.70**	**8.80**
Crude protein	**32.20**	**36.50**	**40.30**	**44.60**
Ether extract	**9.30**	**9.50**	**9.30**	**9.40**
Crude fiber	**2.70**	**2.70**	**3.10**	**3.30**
Ash	**7.30**	**8.20**	**8.80**	**7.70**
NFE [2]	**41.20**	**35.70**	**30.80**	**26.20**
ME (Kcal/100g) [3]	**364.4**	**366.3**	**364.6**	**366.0**
P/E [4]	**88. 36**	**99.64**	**110.53**	**121.8**
Cost of kg (lraqi dinars)	**3.54**	**3.93**	**4.14**	**4.50**

1-Vitamin and mineral mixture / kg premix : Vitamin A, 4.8 million

IU, D3, 0.8 million IU, E, 4g, K, 0.8 g, B1, 0.4 g , Riboflavin 1.6g, B6, 0.6g, B12 , 4 mg pantothinic acid , 4g, Nicotinic acid 8g, Folic acid , 0.4g

2. **Nitrogen Free Extract**.

3. **Based** on 4.5 kcal/g protein, 8.15 kcal/g fats and 3.49 kcal/g **(Jauncey and Ross, 1982).**

4. **milligram/kcal**

Table(3): Performance of *Barbus sharpeyi*(**Günther.1874**)fingerlings as affected by dietary protein level.

parameter	Dietary Protein level (%)			
	32	36	40	44
Initial weight gain (g)	5.50	5.60	5.60	5.40
Final weight gain (g)	41.7d	68.8a	54.7b	50.7c
Weight gain (g)	36.2d	63.2a	54.1b	45.3c
SGR 1	2.26d	2.81a	2.65b	
Feed intake gain (g)	94.21d	113.76a	113.76b	104.19c
FCR 2	2.6 a	1.8d	2.1c	2.3b
PER 3	1.19 b	1.52a	1.18b	0.97c
FER 4	0.38d	0.56a	0.48b	0.43c
Mortality (%)	20. 0 a	12.0c	16.0b	16.0b

Means in the same row having the same letter are not significantly different **(p<0.05)**.

1. **S**pecific **G**rowth **R**ate **(SGR)** (% / day)= Ln W2- Ln W1/Time (days)X100
2. **F**eed **C**onversion **R**atio **(FCR)** = Feed intake (g)/wet weight gain
3. **P**rotein **E**fficiency **R**atio **(PER)** = wet weight (g) / protein intake.
4. **F**eed **E**fficiency **R**atio **(FER)** = wet weight (g) / dry wt feed offered.

Table (4): Effect of dietary protein levels on body composition (% wet weight) of *Barbus sharpeyi* **(Günther.1874)**. Fingerlings.

Protein levels (%)	Protein	Fat	Ash	Moisture
Initial	**14.90**	**7.80**	**4.60**	**72. 70**
32	**15.90a**	**13.90 d**	**4.10 a**	**66.10ab**
36	**16.30b**	**13.70 c**	**4.15 a**	**68.85c**
40	**16.60c**	**13.30 b**	**4.16a**	**65.94a**
44	**17.01d**	**12.80 a**	**4.18a**	**66.01a**

figures in the same column having the same superscript are not significantly different **(P<0.05)**.

Table (5): Economic Efficiency (%) for *Barbus sharpeyi* (**Günther.1874**) fingerlings as affected by dietary protein levels for 90 days

Treatment	Protein level (%)			
	32	36	40	44
Costs				
Fingerlings (l .D) 1	25.0	25.0	25.0	25.0
Feed (l. D) 2	7.0	٩,٨٣	9.88	9.84
Total 3	32.0	34.83	34.88	34.84
Returns				
Net return (l. D.) 4	8.00	31.17	17.62	17.66
Return of investment (l .D) 5(%)	25.00	89.00	50.00	51.00
Productivity of one (l. D) (kg/I.D) 6	0.022	0.040	0.033	0.027
Productivity of one gm of diet (gm)	0.38	0.56	0.48	0.43

Price of fingerlings (lraqi dinars) = price X numbers.
1. Costs of feeds (lraqi dinars) = No. of kg feed X price of Kg
2. Total Cost (lraqi dinars) = Price of fingerlings + costs of feed

3. Net return (lraqi dinars) = Return – Total costs
4. Return of investment (lraqi dinars) = net return/total cost
5. Productivity of one dinars (kg/ lraqi dinars) = weight gain/total cost

6. Productivity of one gm of diet (gm) = weight gain / amount of feed consumed

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الاحتياجات الغذائيــة مــن البروتين لإصبعيـات سمكة البنــي.(Günther.1874) *Barbus sharpeyi* .

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الخلاصة :أستخدم في هذا البحث أصبعيات سمكة البني (*Barbus sharpeyi* **Günther.1874**) التي تزن ٥,٥ غرام، حيث قسمت إلى أربع مجموعات كل مجموعة ٢٥ سمكة(٣ مكرر في كل معاملة) وغذيت على أربع علائق تحتوى على ٣٢ ، ٣٦ ، ٤٠ ، ٤٤ % بروتين لمدة ٩٠ يوم .وقد بينت النتائج أن أفضل نمو وأعلى معدل نمو نسبى وأعلى معامل استفادة من البروتين وأعلى كفاءة غذائية كانت في مجموعة الأسماك التي غذيت على عليقه تحتوى على (٣٦ %)يليها مجموعات الأسماك التي غذيت على علائق تحتوى على ٤٠ ، ٤٤ ، ٣٢ % بروتين خام على التوالي .ومنها وجد أن زيادة بروتين العليقة يؤدى إلى زيادة بروتين الجسم كما وجد أن هناك علاقة عكسية بين محتوى الرطوبة ومحتوى الدهن في الجسم ولا توجد أي تأثير لمستويات البروتين المختلفة في العليقة على كمية الرماد في الجسم .ومن الناحية الاقتصادية كان أفضل قيمة للانتاج الصافي إلى إجمالي التكاليف (٨٩ %) في العليقة التي تحتوى على (٣٦ %)بروتين يليها ٥١، ٥٠، ٢٥% في المجموعات التي غذيت على علائق تحتوى على ٤٠ ، ٤٤ ، ٣٢ % بروتين على التوالي. مما سبق يستنتج أن الاحتياجات الغذائية لاصيعيات سمك البني (*Barbus sharpeyi* **Günther.1874**) هي(٣٦%) بروتين خام.