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EFFECT OF VARYING DIETARY PROTEIN LEVELS ON GROWTH, FEED CONVERSION EFFICIENCY (FCE) AND FEED CONVERSION RATIO (FCR) OF ORNAMENTAL FISH NEMACHELIUS BOTIA

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ABSTRACT

Present study was conducted to study the effect of varying dietary protein levels on growth, feed conversion efficiency (FCE) and feed conversion ratio (FCR) of ornamental fish (*Nemachelius botia*). Five iso-caloric diets containing different levels of proteins 25%, 30%, 35%, 40% and 45% were prepared from both animal and plant sources in the pelleted form and was fed to the experimental fishes in triplicate manner @ 5% of the body weight for a period of 60 days . On the basis of weight gain, FCE and FCR following trend emerged i.e., 40%> 35 %.> 45%> 30%>25%. The results confirmed the best protein level for optimum growth of *Nemachelius botia* to be 40% but it was significantly different achieved by 45% ($p<0.01$) protein diet. Specific rates were 2.35±0.04, 2.20±0.03, 216±0.02, 2.05±0.05 and 2.00±0.02 for 40%, 45%, 35% 30% and 25% protein diets respectively. FCE was lowest at 25% (14.52±0.02) and it further increased with increasing protein levels up to 40% (16.31±0.03) but beyond this it again decreased i.e., at 45% (15.25±0.02). FCR was maximum at 25% (6.88±0.05) and it further decreased with increasing protein level minimum was present in 40% (6.12±0.02) beyond this it again increased 45% (6.53±0.01).

KEYWORDS: Dietary protein, Specific growth rate, Feed conversion ratio, Feed conversion efficiency and *Nemachelius botia*.

INTRODUCTION

The ornamental fish sector is an extensive and global component of international trade, fisheries and aquaculture development. Ornamental fishes or Aquarium fishes are called “living jewels” having brilliant colour combinations on their body, attractive body shapes and innumerable fin structures which made them objects of considerable aesthetic value. Ornamental fish keeping is one of the most popular hobbies in the world today. The growing interest in aquarium fishes has resulted in steady increase in aquarium fish trade globally. The start of the millennium projected an annual global exports of USD 176 million which compounded annually at a growth rate of 6.2% and reached around 342 million USD in 2010 (Tissera k. 2012). Besides enjoying the rich piscine diversity, the Indian exports are hardly 0.3% of the global exports. But, around 90% of them exported are wild caught indigenous fish (Silas et. al. 2011). The industrial development of fresh water ornamental fish culture has been hampered by the lack of suitable feeds for feeding the fish at various production stages.

In India, even though the potential for expanding this trade is very high, lack of availability of artificial feed is a major bottleneck for, its expansion. Feeding natural feed is practically impossible for large scale ornamental fish production. A variety of feeds have been developed and manufactured for ornamental fish. Most brands of commercially feeds used for freshwater ornamental fishes are of general type and are formulated to meet the maintenance needs of large groups of fishes. This strategy makes sense from the feed manufacturer's point of view because they want to attract a large number of consumers for their products. Such feeds may not support the nutritional requirement of all the fishes. Unlike food fishes, ornamental fishes are not given due consideration for their growth as survival is the major criteria considered for this trade. Though there is demand of feed for ornamental fish very little information is actually available about the nutritional requirements of the various cultured ornamental fishes.

The main objective of the present study was to study effect of varying dietary protein levels on growth, feed conversion efficiency (FCE) and feed conversion ratio (FCR) of ornamental fish (*Nemachelius botia*).

MATERIALS AND METHODS

Five iso-caloric diets containing different levels of protein such as 25, 30, 35, 40 and 45% were prepared in pellet form using fish meal, as a major source of protein as it is generally recognized that purified proteins, such as casein, are deficient with respect to certain amino

acids and it is being expensive protein source for the average fish nutritionist in developing countries and this has led present investigator to formulate practical diets using cheaper locally available feed ingredients. Proportion (%) different ingredients used in the formulation diets are shown in Table 1.

Table 1: Proportion (%) of different ingredients used in formulated diets for *Nemacheilus botia*.

	Diets				
	25%	**30%**	**35%**	**40%**	**45%**
Fish meal	----------	26	32	38	46
Rice bran	49.50	20	15	05	02
Wheat bran	-----	24	15	05	02
Soyabean	------	15	22	24	24
Mustard oil cake	49.50	14	18	22	25
Vegetable waste	-------	----	05	05	---
vitamin + minerals*	01	01	01	01	01
Total	100	100	100	100	100

a* Nutrition super forte (Rejuvenating combination of multivitamin and multi minerals, AROSOL chemicals PVT. Limited)

Vitamin A 700,0001.U	Vitamin D3 140,0001.U	Folic acid 100 mg
Vitamin E 250 mg	Niacin amide 100 mg	Iron 1500 mg
Iodine 325 mg	Cobalt 150 mg	Magnesium 6000 mg
Manganese 1500 mg	Zinc 3000 mg	Selenium 10 mg
Potassium 100 mg	Sulphur 7.2gm	Calcium 270 gm
Phosphorous 130 gm	Copper 1200 mg	Fluorine 300 mg

Proximate composition of the feed ingredients and experimental diets were determined in the laboratory using standard methods. The crude protein and lipid contents of feed ingredients were determined by Lowery method and Folch method. The ash content was determined by first igniting the sample and then heating it in the muffle furnace at 550^{o} C (±10^{o} C) for 6h (AOAC, 1995). Crude fibre was determined by acid and alkali digestion (Pearson, 1976). Nitrogen free extract which was considered as carbohydrate was calculated by difference method (Hasting, 1976). The calorific value of the feed was calculated in terms of KJ/g using the energy value 9 Kcal/g for fat, 4 Kcal/g for carbohydrate (Hasting, 1976) and 5Kcal/g for protein (Smith,1975; Viola, 1977).

Table 2: Proximate composition of the experimental diets given during experiment.

Diets	Dry matter	Crude protein	Crude lipid	Ash	Nitrogen free extract	Calorific content KJ/g
25%	90.88	23.30	5.39	14.39	34.12	13.79
30%	91.55	28.23	5.26	17.39	32.32	14.23
35%	91.49	32.95	5.79	17.45	28.50	14.56
40%	91.29	38.10	5.95	17.48	25.65	14.87
45%	92.01	43.60	6.95	17.35	20.89	15.09

Nemacheilus botia weighing (1.53±0.02) was used for the experiment. They were collected from Natural water bodies of Gou mansha, Jammu (J&K) at a latitude and longitude 33.7782° N, 76.5762° E Before dividing the fish or conducting the experiment, they were acclimatized in the laboratory for about 2 weeks. During that period the fish were fed (rice bran and mustard oil cake 1:1). The experiment was conducted in labs conditions in 100 l plastic tubs under flow through system along with aerators. They were divided in five groups with 25 fishes each. The fry were fed twice in a day at the rate 5% of the body weight during the period of 60 days and the fed quality was readjusted after every fifteen day sampling, based on the growth of fishes. 1.3.1 Sampling and growth measurement: The fishes from each tub were captured once in a fifteen days and were weighed individually and their growth was assessed by calculating following growth parameters. Percentage weight (% WG): It was calculated by using the formula: %WG = [(Wf –Wi)/ Wi] x 100.

Where Wf is the final weight of the fish WI is the initial weight of the fish.

Specific growth rate: The formula used for calculating SGR was:

$$SGR = \frac{(\text{In final weight} - \text{In initial weight}) \times 100}{\text{No. of days of experiment}}$$

Feed conversion ratio FCE (%): It was calculated by using the formula:

FCE (%) = [(Gain in wet weight of fish/Feed Fed)] x 100

Feed conversion ratio (FCR): the FCR was calculated by using the formula:

FCR = Feed fed / Gain in weight of fish

Statistical analysis: A one way analysis (ANOVA) was conducted in each and every experiment, using the computer software ‘Analyses it’.

RESULTS AND DISCUSSION

Table 3: Initial weight, final weight, weight gain, SGR FCR and FCE of *Nemaceilus botia.*

	Treatment				
Parameters	**25%**	**30%**	**35%**	**40%**	**45%**
Initial weight g/fish	1.55±0.03	1.57±0.01	1.51±0.04	1.47±0.01	1.54±0.05
Final weight g/fish	2.75±0.04	2.80±0.03	2.83±0.07	2.88±0.02	2.84±0.02
Weight gain g/fish	1.20±0.03	1.23±0.01	1.32±0.05	1.41±0.03	1.30±0.02
SGR	2.00±0.02	2.05±0.05	2.20±0.03	2.35±0.04	2.16±0.02
FCE	14.52±0.01	14.62±0.02	15.52±0.01	16.31±0.03	15.25±0.02
FCR	6.88±0.05	6.82±0.02	6.43±0.03	6.12±0.02	6.55±0.01
Survival rate	95%	93%	91%	96%	94%

The present study on relative growth performance of *Nemacheilus botia*, in response to diets with varying levels of protein viz. 25, 30, 35, 40 and 45% for a period of 60 days shows that fish fry fed by 40% protein diet attained best growth, while 25% protein exhibited least growth. On the basis of net weight gain the following trend emerged: 40% > 45% > 35% > 30% > 25%. The average net weight gain of fry fed on different protein diets was 1.53±0.009 at 40, 45, 35, 30 and 25% respectively. (Table 3). However, there was insignificant difference ($p>0.01$) in net weight gain between 40% and 45% protein diets. During present investigation growth of fish was proportional to the dietary protein levels up to 40% beyond which it was not proportional i.e. percentage weight gain of fish increased with an increase in dietary protein levels up to 40% and thereafter the growth increment was insignificant ($p>0.01$) Similar growth pattern has been reported for mrigal fry (Singh et al., 1987), walking cat fish fry, *Clarias batrachus* (Chuapoehuk, 1987), *Cirrhina mrigala* (Mathivanan 2006), *Heterobranchus* (Jamabo and Alfred-Ockiya, 2008) and for *Catla catla* (Gandotra *et al*., 2014).

During the present investigation the value of SGR was highest for fish fed with 40% protein 2.35±0.04 and lowest for 25% dietary protein 2.00±0.02 (Table 3). SGR increases with increasing dietary protein level up to 40% and above optimum protein level SGR decreased. These results agree with findings of Mohanta *et.al*., 2008 and Ebrahimi and Ouraji 2010 who reported that SGR increased with increasing dietary protein level from 32% to 42%. Similarly, FCR obtained with different diet having levels of proteins, further in the present investigation the FCR decreased with increasing protein level although not significantly above 40% in fish. Similar to present results Ghazala *et. al.* 2011, Otchoumou *et. al*. 2012 and Gandotra et al., 2014 have reported that FCE values decreased with increasing protein levels.

In the present investigation, the Food Conversion Efficiency (FCE) was higher in the fish with diet containing 40% protein level showing the best utilization of the diet and lowest for 25% dietary protein. Present observation further reveals that food conversion efficiency increased with increasing protein level in the diet up to 40% in fry and then decreased afterwards. In addition FCE of fish fed with varying levels of dietary protein indicated that optimum dietary protein requirement was 40% in fry. The present trend of FCE is similar to that reported for catfish, Mystus nemurus (NG et.al. 2001), Sawhney and Gandotra 2010 in *Tor putitora* and Gandotra et al., 2014 in *Catla catla* Thus the present results clearly indicate that present fish species i.e. *Nemacheilus botia* require protein level i.e. 40% or less than 45% when fed artificially, for better growth. It was interesting to find that weight gain; SGR, FCR and FCE were lowered if protein in feed was higher than the required level of 40% by the present fish species.

BIBLIOGRAPHY

1. AOAC, *Official Methods of Analysis of AOAC International*, Vol. 1, 16th edn. (ed. Cunniff, P.A.). AOAC International, Arlington, USA, 1995.
2. Chuapoehuk, W. Protein requirement of walking catfish (*Clarias batrachus* L.) fry. Aquaculture, 1987; 63: 15-219.
3. Ebrahimi, G. and Ouraji, H., 2010 Growth performance and body composition of kutum fingerlings, *Rutilus frisii kutum* (Kamenskii 1901), in response to dietary protein levels. *Turk J Zool*, 2012; 36(4): 551-558.
4. Folch J., Lees M., Stanley G.H.S. A simple method for the isolation and purification of total lipids from animal tissues. *Journal of Biological Chemistry*, 1957; 226: 497–509.
5. Gandotra, R., Parihar, D. S., Koul, M., Gupta, V., Kumari, R. Effect of varying dietary protein levels on growth, feed conversion efficiency (FCE) and feed conversion ratio (FCR) of *Catla catla* (Ham.) fry. *Journal of international academic research for multidisciplinary*, 2014; (2): 28-35.
6. Ghazala, R. A. B. Tabinda, B.A., and Yasar, A. Growth response of juvenile grass carp (*Ctenopharyngodon idella*) fed isocaloric diets with variable protein levels. *The Journal of Animal & Plant Sciences*, 2011; 21(4): 850-856.
7. Hasting, W.H., Fish nutrition and fish fed mixture. Proceedings of the FAO Technical Conference on Aquaculture, (FTCA'76), Kyoto, Japan, 1976; 13-13.
8. Jamabo, N.A. and Alfred-Ockiya, J.F. Effects of dietary protein levels on the growth performance of *Heterobranchus bidorsalis* (Geoffrey- Saint-Hillarie) fingerlings from Niger delta. *Afr. J. Biotechnol*, 2008; 7(14): 2483-2485.

9. Mohanta, K.N., Mohanty, S.N., Jena, J.K. and Sahu, N.P. Protein requirement of silver barb, *Puntius gonionotus* fingerlings. *Aquacult. Nutr*, 2008; 14: 143-152.
10. NG, W.K., Soon, S.C. and Hashim, R. The dietary protein requirement of a bagrid catfish, *Mystus nemurus* (Cuvier and Valenciennes), determined using semi purified diets of varying protein level. *Aquac. Nutr*, 2001; 7: 45-51.
11. Otchoumou, K. A., Célestin M. B., Olivier, A. E., Yao, L. A., Sébastien L. N. and Jacques K.D., Effects of increasing dietary protein levels on growth, feedutilization and body composition of *Heterobranchus longifilis* (Valenciennes, 1840) fingerlings *African Journal of Biotechnology*, 2012; 11(2): 524-529.
12. Pearson, D., the Chemical Analysis of Foods, 7thed. Churchill Living stone, London, 1976.
13. Sawhney, S., Gandotra, R. Growth Response and Feed Conversion Efficiency of *Tor putitora* (Ham.) Fry at Varying Dietary Protein levels. *Pakistan Journal of Nutrition*, 2010; 9(1): 86-90.
14. Silas, E. G., Gopalakrishnan, A., Ramachandran A., Anna, M.T.V., Kripan, S. P. K.R., Anil. K.P., Ram, M.M.K., Anikuttan, K.K. Guidelines for Green Certification of Freshwater Ornamental Fish. MPEDA, Kochi, 2011.
15. Singh, B.N., Sinha, V.R.P. and Kumar, K. Protein requirement of an Indian major carp, *Cirrhinus mrigala* (Ham.) *Intl. J. Acad.Ichthyol*, 1987; 8(1): 71-75.
16. Smith, R.R., Metabolizable energy of food stuffs for trout. Proceedings of the Cornell Nutrition Conference, (CNC'75), Vornell University, Ithaca, New York, 1975; 43-47.
17. Tissera, K., the Global Ornamental Fish Industry – An Outline of the First Decade of the New Millennium. In: International Conference Sustainable Ornamental Fisheries Way Forward, Souvenir, held on March Kochi, 2012; 23–25.
18. Viola, S., Energy values of feed stuffs for carp. Bamidgeh, 1977; 29: 29-30.