A.F.M.Arifur Rahman *et al*, International Journal of Pharmaceutical Sciences and Business Management,
Vol.1 Issue. 1, September- 2013, pg. 18-28 **ISSN: 2310-6913**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND BUSINESS MANAGEMENT

GROWTH PERFORMANCE OF STINGING CATFISH (Heteropneustes Fossilis; Bloch) REARING AND FEEDING ON FORMULATED FISH FEED IN THE LABORATORY CONDITION

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Abstract

Current study evaluates the effect of formulated feed on growth performance and feed utilization of shingi fish (Heteropneustes fossilis) (Bloch) in glass aquarium culture system. Two formulated feeds; A & B with two different protein levels 35% & 28% were used as treatment feed. Change in growth performance by the shingi fish fed on two types of fish feed during the rearing and feeding trial have been assessed by the determination of condition factor, survival rate, average daily gain (ADG), and specific growth rate (SGR%). The value of condition factor, ADG and SGR% have been found to have similarities with the results obtained by other working scientists both at home and abroad. The fish feed A (35% protein) have been found to be effective for better growth of the shingi fish.

Key words: *Stinging Catfish (Heteropneustes fossilis); ADG; SGR; Formulated feed*

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1. Introduction

Fisheries resources have plays a dominant role in the nutrition, employment generation, culture, tradition and food habit of the people of Bangladesh, foreign exchange earnings and other areas of national economy. *Heteropneustes fossilis* are known as Asian stinging cat fish or fossil cat and in our country this fish locally called shing fish. It is commercially as well as aquaculturally an important species in many Asian countries (Akand *et al*., 1991) and it is an indigenous species to Indo-Pak-Bangladesh sub-continent.

Fish diets must provide energy source and should be in proper balance with respect to protein, lipid, carbohydrate minerals and vitamins and other growth factors. In commercial catfish feeds, the energy, ratio ranges from 66-74 k. cal \ kg for each 1% of protein (Lovell, 1977a). Proper food selection is important both from nutritional and economical point of view. A food particle should deliver the necessary nutrients and in a form that can easily be consumed by the fish offering the type and correct amount of feed will result in more efficient production and increased profits. Food quality, food type and foods cost should be of primary consideration in selecting of the best food. Food quality is primarily dictated by food composition is therefore important. A mixture of ingredients is necessary to provide a balance of required nutrients. No single ingredients can adequately serve as the total nutritive source; therefore, a high quality food should contain a blend of animal and plant proteins and well as supplemental vitamins and minerals.

Successful controlled method of culture depend on a good knowledge of nutritional requirements and food of the larvae if adequate techniques being developed regarding the nursing and rearing of shingi fry in controlled

conditions, it would definitely pave the way for the fish farmers to adopt fish farming as a lucrative earning profession, so as to ensure steady availability of cheap yet good quality fish seed for augmentation commercial fish production.

Any fish cultured with artificial feeds need high percentage of protein in the diet for fast growth and better growth performance. However requirement of protein by a particular species of fish vary with others.

It has been established that protein is required by all animals for body maintenance and growth, and that the protein level needed for these functions varies with the species and culture environment (Delong *et al.*, 1958, Lovell, 1972). For fish, the optimum amounts of protein in formulated feeds are important because either low or high levels of protein may lead to poor growth. As well, excess protein in fish diet may be wasteful and cause the diets to be unnecessarily expensive.

Therefore, in the present study attempts were taken to investigate the growth performance in formulated feed for *H. fossilis* fish. For carrying out feeding trial under laboratory conditions, rearing facilities were created and *H. fossilis* fish has been selected as the experimental fish.

2. MATERIALS AND METHODS

Experimental design

The experiment was carried out in the Fish Technology Research Laboratory of Institute of Food Science and technology, BCSIR, Dhaka. The experiment was design for rearing stinging cat fish (*H. fossilis)* in six glass aquariums numbered by 1,2,3,4,5 &6 of 0.21m^3 (1.2m x 0.42m x 0.42m) of each. The aquariums were kept in Fish Technology Laboratory room of research building. From six aquariums number 1, 2 & 3 were kept under treatment “A” where feed A was used and number 4, 5 & 6 were kept under treatment “B” where feed B was used. To each of the experimental aquariums 15 fish were released having length 9.5±1.1 cm and weight 9.13±1.94 g at the initial period. *H. fossilis* were released within the aquarium after grouping according to length and weight. They were fed two times in day at 10.00 a.m. and 4.00 p.m. for both treatments. Survival

Rate (SR), Condition Factor (K), Average Daily Growth (ADG) and Specific Growth Rate (SGR) were estimated for measuring growth performance of fish for two different feed A & B at the end of 15, 35 and 60 days of feeding. A steel measuring scale was used for measuring the lengths and electronic balance for body weight.

Feed preparation

The formulated feed ingredients were mixed together and made it pellet with Pellet making machine. After drying two types of feed it was stored by marking as Feed A and Feed B. Proximate composition of each of the feed represented in the Table-1.

Table-1: Proximate composition of the formulated fish feed in the laboratory.

Feeds	Feed A	Feed B
Protein (%)	35	28
Carbohydrate (%)	32	40
Fat (%)	8	7
Ash (%)	14	13
Moisture (%)	11	12

Proximate composition of fish

Proximate composition of the *H. fossilis* fish was determined at the initial stage of the experiment, by following A.O.A.C method (1990). Same types of analysis were also carried out at the end of 60 days feeding trial.

Study on fish growth

Estimation of Survival Rate

The survival rate of *H. fossilis* for each treatment and replication was estimated at the end of the 15 days, 35 days and 60 days. The survival rate was calculated thus,

$$\text{Survival rate (\%)} = \frac{\text{No. of actual fish survived}}{\text{No. of actual fish stocked}} \times 100$$

Condition factor (K)

Condition factor of the fish was calculated by the following formula as suggested by Hile (1936)

$$K = \frac{W}{L^3} \times 100$$

Where,

K= condition factor
W = body weight in grams
L= body Length in centimeters

Average daily gain (ADG)

Average daily gain was defined by the following formula:

$$ADG = \frac{\text{Mean final fish weight - Mean initial fish weight}}{\text{Time } (T_2 - T_1)}$$

Specific growth rate (SGR %)

Specific growth rate (SGR) was calculated as the percentage increase in weight per animal per day as suggested by Hopkins (1992), i.e.

$$SGR\% = (In\ WT - lnW_1) / (T - t)\ X\ 100;$$

Where,

SGR% = Percentage increase in body weight per fish per day;
In $W_{T=}$ Natural log of weight at time T;
ln Wt= Natural log of initial weight;
T= Time T;
t= initial time.

3. Results

Detailed result of the study on the proximate composition of fish, survival rate and growth performance of stinging cat fish (*H.fossilis*) reared in aquariums fed on two formulated feed (Feed A-35% protein and Feed B-28% protein) as recorded during the period of investigation were presented under the following headings.

3.1 Proximate composition of fish

Before feeding, fish of treatment A carried moisture 79.20±0.03%, Protein 17.45±0.01%, Fat 1.01±0.01% and ash 2.33±0.01% and fish of treatment B carried moisture 79.17±0.02%, Protein 17.48±0.01%, Fat 1.05±0.01%

and ash 2.30±0.04%. After 60 days of feeding, fish of feed A carried moisture 77.21±0.03%, Protein 18.24±0.01%, Fat 1.58±0.02% and ash 2.98±0.03% and fish of feed B carried moisture 77.49±0.09%, Protein 17.90±0.05%, Fat 1.71±0.01% and ash 2.90±0.05%. (Table- 2)

Table -2: Proximate composition of H. fossilis before feeding and after 60 days rearing period in treatment A and B

Feeds	A		B	
	Before Feeding	*After 60 days*	*Before Feeding*	*After 60 days*
Moisture (%)	79.20±0.03	77.21±0.03	79.17±0.02	77.49±0.09
Protein (%)	17.45±0.01	18.24±0.01	17.48±0.01	17.90±0.05
Fat (%)	1.01±0.01	1.58±0.02	1.05±0.01	1.71±0.01
Ash (%)	2.33±0.01	2.98±0.03	2.30±0.04	2.90±0.05

3.2 Survival Rate

In treatment A, survival rates were 93.33% at the end of 15, 35 and 60 days and in treatment B, it was 93.33% at the end of 15 & 30 days and 90% at the end of 60 days. Here all aquariums showed same result except the aquarium of treatment B at the end of 60 days.(Table-3)

Table-3: Survival rate (%) of H. fossilis in treatment A and B at the end of 15, 35 and 60 days of study period

Treatment parameters	A			B		
Study period (days)	15	35	60	15	35	60
Survival rate (%)	93.33	93.33	93.33	93.33	93.33	90

3.3 Condition Factor (K)

In treatment A, Condition Factors (K) were 1.06±0.04 g/m^3, 1.01±0.01g/m^3 and 0.94±0.07g/m^3 at the end of 15, 35 and 60 days respectively and in treatment B; it was 1.16±0.15 g/m^3, 1.17±0.16 g/m^3, 0.98±0.15 g/m^3 at the end of 15, 30 and 60 days respectively. In both treatments K values were decreased with increasing the day. (Table-4)

Table 4: Condition factor of H.fossilis in treatment A and B at the end of 15, 35 and 60 days of study period

Days	A (g/m^3)	B ((g/m^3))
15	1.06±0.04	1.16±0.15
35	1.01±0.01	1.17±0.16
60	0.94±0.07	0.98±0.15

3.4 Average Daily Gain (ADG)

In treatment A, Average Daily Gain (ADG) were 0.119±0.005g, 0.128±0.016g and 0.134±0.024g at the end of 15, 35 and 60 days respectively and in treatment B; it was 0.098±0.006g, 0.099±0.003g, 0.104±0.002g at the end of 15, 30 and 60 days respectively. In both treatments ADG values were increased with increasing the day. (Table-5)

Table-5: Average Daily Gain (ADG) of H. fossilis in treatment A and B at the end of 15, 35 and 60 days of study period

Days	A (g)	B (g)
15	0.119±0.005	0.098±0.006
35	0.128±0.016	0.099±0.003
60	0.134±0.024	0.104±0.002

3.5 Specific Growth Rate (SGR)

In treatment A, Specific Growth Rate (SGR) were 1.45±0.04%, 1.18±0.06% and 1.11± 0.01% at the end of 15, 35 and 60 days respectively and in treatment B; it was 1.37±0.19%, 1.08±0.14%, 1.13±0.03% at the end of 15, 30 and 60 days respectively. In both treatments SGR values were decreased with increasing the day. (Table-6)

Table-6: Specific growth rate (SGR %) of H. fossilis in treatment A and B at the end of 15 days, 35 days and 60 days feeding period

Days	A (%)	B (%)
15	1.45±0.04	1.37±0.19
35	1.18±0.06	1.08±0.14
60	1.11± 0.01	1.13±0.03

4. DISCUSSION

4.1 Proximate composition of fish

Investigations were carried out on the proximate composition of shingi fish (*H. fossilis*) before and after the rearing and feeding trial. This result revealed that the protein content increased in treatment A from 17.45±0.01% to 18.24±0.01%, fat content increased from 1.01±0.01% to 1.58±0.02%, ash content increased from 2.33±0.01% to 2.98±0.03% but moisture contents decreased from 79.20±0.03% to 77.21±0.03% and the

protein content increased in treatment B from 17.48±0.01% to 17.90±0.05%, fat content increased from 1.05±0.01% to 1.71±0.01%, ash content increased from 2.30±0.04% to 2.90±0.05% but moisture contents decreased from 79.17±0.02% to 77.49±0.09% at the end of rearing and feeding trial of shingi fish (*H. fossilis*) that is except moisture content the other nutrients protein, fat and ash of the shingi fish have been found to increase with the progress of the study period but .

4.2 Survival rate

During the experimental period in treatment A, survival rates were 93.33% at the end of 15, 35 and 60 days and in treatment B, it was 93.33% at the end of 15 & 30 days and 90% at the end of 60 days. Here all aquariums showed same result except the aquarium of treatment B at the end of 60 days. This findings have got similarities with the findings of Akand *et.al* (1991) they have got 82 to 93% survival rate of shingi fish during the feeding trial. Niamat and Jafri (1984) they have also got 100% survival rate of shingi fish *H. fossilis* in a study with formulated pelleted feed. Mustafa *et.al* (1995) in a study with red sea bream with dietary algae observed survival rate ranged from 77.8-87.8% these findings are within our observed value of survival rate of *H. fossilis.*

4.3 Condition factor

In treatment A, Condition Factors (K) were 1.06±0.04 g/m^3, 1.01±0.01g/m^3 and 0.94±0.07g/m^3 at the end of 15, 35 and 60 days respectively and in treatment B; it was 1.16±0.15 g/m^3, 1.17±0.16 g/m^3, 0.98±0.15 g/m^3 at the end of 15, 30 and 60 days respectively. In both treatments K values were decreased with increasing the day. That is the values of condition factor are nearer to one. This finding has got similarities with those of Saha *et al.*(1998) who also got this values of condition factor as nearer to one in case of *Clarias batrachus* (Linn.) fed on formulated diets. Rahman *et al* (1997) in a study on the survival and growth of cat fish after giving selected supplemental feeds got the values of condition factor between 0.81-0.87 this values also coincides with our condition factor value .

4.4 Average daily gain (ADG)

In treatment A, Average Daily Gain (ADG) were 0.119±0.005g, 0.128±0.016g and 0.134±0.024g at the end of

15, 35 and 60 days respectively and in treatment B; it was 0.098±0.006g, 0.099±0.003g, 0.104±0.002g at the end of 15, 30 and 60 days respectively. In both treatments ADG values were increased with increasing the day. Sangrattanakhul (1989) found that the ADG of *A. testudineus* fish ranging from 0.100-0.120g this findings are more or similarities with us.

4.5 Specific growth rate (SGR %)

In treatment A, Specific Growth Rate (SGR) were 1.45±0.04%, 1.18±0.06% and 1.11± 0.01% at the end of 15, 35 and 60 days respectively and in treatment B; it was 1.37±0.19%, 1.08±0.14%, 1.13±0.03% at the end of 15, 30 and 60 days respectively. In both treatments SGR values were decreased with increasing the day. This finding resembles the Medawars (1945) fifth law "the specific growth rate declines more and more slowly as the organism increases in age". Minot (1908) was the first person to recognize that for most animals the specific growth rate is highest early in life and that it typically decreases with increasing age, becoming zero in some animals and his epigram. "Organism age fastest when they are young" is expressed by Medawars (1945) fifth law. The SGR% value of shingi fish in our experiment also shows the same trend mentioned in Medawars (1945) fifth law. Hossain *et al*. (1991) was recorded the highest SGR (1.80) of *H. fossilis* by supplying diet which has more or less similarities with our finding values.

5. CONCLUSION

The prepared fish feed are found to be effective for the better growth and culture of the experimental shingi fish (*H. fossilis*). The fish feed containing 35% protein is the best feed for better growth. ADG, condition factor, SGR% of the shingi fish at the Laboratory Condition showed results similar to the results of other worked scientists both at home and abroad.

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