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GROWTH RESPONSE OF THAI SARPUNTI (*Barbodes gonionotus*) FRY TO THREE SELECTED FEEDS UNDER LABORATORY CONDITION

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ABSTRACT

Trial on Growth and survival of Thai sarpunti, *Barbodes gonionotus* (Bleeker, 1850) was carried out with three different feeds for a period of 90 days in laboratory condition. Three feeding treatments (T_1, T_2 and T_3) having three replications (R_1, R_2 and R_3) each were applied in nine rectangular glass aquaria (45x25x24 cm^3). Live planktonic feed (approximately 5000 cells/L), plankton and Saudi-Bangla nursery feed, plankton and Saudi-Bangla nursery feed with 17α-methyl testosterone were considered as T_1, T_2 and T_3 respectively. One month-old fries of *B. gonionotus* (average length 19.0±0.15 mm and weight 90.0±0.05 mg) were stocked at a stocking density of 4.1 fries/L of water in each aquarium. The highest length gain, weight gain and SGR (13.73±0.37 mm, 293.36±7.26 mg and 1.62±0.20 respectively) were found in T_2 which was significantly ($P<0.05$) different from T_1 and T_3. The survival rate of fry was highest (82%) in T_2 and significantly ($P<0.05$) different from T_1 and T_3. However, the present study suggested that Saudi-Bangla nursery feed with plankton could be recommended at farmer's level for mass production of Thai sarpunti.

Key words: Thai sarpunti, growth, Saudi-Bangla nursery feed, plankton

INTRODUCTION

Barbodes gonionotus (Bleeker, 1850), commonly known as silver barb is an exotic fish in Bangladesh belong to the Cyprinidae family. Among all the exotic fish species of Bangladesh it is considered as one of the suitable species for aquaculture due to its better palatability, high yield potential and market demand and its high growth performance in both monoculture and polyculture systems (Haque *et al.*, 1998). But very few works have been conducted on production of Thai sarpunti in earthen pond using supplementary feeds (Hossain *et al.*, 1998; Kohinoor *et al.*, 1993).

Many commercial fish feeds viz. Saudi-Bangla nursery feed, Quality feed, Aftab feed, Super agro feed, A.I.T feed etc. which are commonly used for mass production of Thai sarpunti. Among those, Saudi-Bangla nursery feed have become popular because of its protein (30%) content. Still now there are many uncultured seasonal ponds in Bangladesh where this fish can grow well using this feed. These seasonal ponds are very productive and valuable assets for the farmers but they do not have the technology to utilize the seasonal ponds for culture of fish to improve their social, economical and the nutritional status (Mirza *et al.*, 1997). Small fish can make profit by culturing in shallow water bodies with low cost feeds (Felts *et al.*, 1996). Ali (1997) stated that small fish provide food and nutrition, subsistence and supplemental income to the great majority of people of this country. Thus small fish along with some of the small prawn are the only source of animal protein for the rural landless and the poor people.

In addition, 17α-methyl testosterone also tested with supplementary feed to know its suitability for *B. gonionotus* growth acceleration. The wide range of 17α-methyl testosterone hormone as a feed supplemental agent practiced in growth enhancement of many fishes. A study investigated on the turbot *(Scophthalmus maximus)* using supplementary feed containing the *Paralichthys olivaceus* growth hormone (GH) gene to observe the growth comparison (Shunmei *et al.*, 2007). The first success in inducing sex inversion in European strain of common carp, using 17α-methyl testosterone with supplemental feed was achieved by Nagy *et al.*, (1981). On the other hand, 17α -methyl testosterone acts to the maleness and fatless in *Cyprinus carpio.* However, the 17α-methyl testosterone has also impacts on the growth of C. *carpio* (Arif *et al.*, 2007). However, the present study was undertaken to compare the growth of Thai sarpunti using three different feeds.

MATERIALS AND METHOD

Study period and area

The experiment was conducted in the backyard hatchery of Bangladesh Agricultural University, Mymensingh for a period of 90 days from 13 June to 28 August, 2007. One month old fries of *B. gonionotus* were stocked in glass aquaria (45x25x24 cm^3) containing 17 L of deep tubewell water in each. The fries were collected from Bhrahmaputra fish seed complex, Shambhuganj at Mymensingh in Bangladesh.

Experimental design

The experiment was designed with 3 treatments (T_1, T_2 and T_3) having 3 replications (R_1, R_2 and R_3) of each. Each replication contained 70 fries (average length 19.0±0.15 mm and average weight 90.0±0.05 mg) at stocking density of 4.1 fries/L of the volume of water were reared. The water of each aquarium was exchanged by half of the volume with fresh deep tubewell water once a day to avoid water quality deterioration due to unused feed. The faecal out-put and unused feeds were removed from the aquarium by siphoning. Aeration was provided for 22 hrs in a day and was stopped for one hour each time (0900 and 1600 hrs) while fish received the supplied feed.

Feed formulation and application

The ingredient of three different feeds used in T_1 T_2 and T_3 are shown in Table 1. The analyzed proximate composition of Saudi-Bangla nursery feed is shown in Table 2. Only plankton at the rate of approximately 5000 cells/L of water was provided in T_1. In addition, plankton and Saudi-Bangla nursery feed, and plankton and Saudi-Bangla nursery feed with 17α-methyl testosterone (200 ppm) at the rate of 5% of body weight of stocked fries were also provided for T_2 and T_3 respectively. The daily ration was given twice a day (0900 and 1600 hrs).

Table 1. The ingredient of three different experimental diets of growth and survival of *B. gonionotus*

Ingredient	T_1	T_2	T_3
1. Plankton			
Phytoplankton:			
a) Bacilariophyceae			
b) Chlorophyceae			
c) Rhodophyceae			
d) Cyanophycea			
e) Euglenophyceae	Present	Present	Present
Zooplankton			
a) Copepoda			
b) Rotifera			
c) Cladoceran			
d) Arthropoda			
2. Saudi Bangla nursery feed	Absent	Present	Absent
3. Saudi-Bangla nursery feed with 17α-methyl testosterone	Absent	Absent	Present

Plankton collection

For plankton study of both phytoplankton and zooplankton incase of T_1, T_2 and T_3 five liters of water samples were collected every week and then passed through plankton net of 55 blotting silk of 100µm mesh size. The collected samples were concentrated to a volume of 40ml and preserved in plastic vials with 5% formalin for further analysis. From the concentrated volume of plankton samples, 1ml was taken by a dropper and then put on the Sedwich-Rafter counting cell. The counting chamber was covered with a cover slip so as to eliminate the air bubbles. Then Sedwich-Rafter counting cell were placed under an electrical microscope

(magnification-10×10) and both phytoplankton and zooplankton were counted from 10 random fields (units) out of 1000 units. The analysis of both phytoplankton and zooplankton was done by following formula:

$N = (P \times C \times 100)/L$

Where, N = number of plankton cells;

P = total number of plankton counted in 10 fields;

C = volume of final concentrate of the sample (ml);

L = volume of the pond water sample (L);

Plankton was identified with the aid of standard keys (Prescott 1962; Needham and Needham 1962; Bellinger 1992).

Analysis of proximate composition

Proximate composition of the feed ingredient was subjected to the estimation of protein, lipid, ether extract, crude fiber, NFE and ash by standard method (AOAC, 1980). The proximate composition of plankton used in T_1, T_2 and T_3 were not analyzed.

Table 2. Proximate composition (%) of Saudi Bangla nursery feed used in *B. gonionotus* growth study

Feed ingredient	Parameters					
	Dry matter	Crude protein	Ether extract	Crude fibre	NFE[1]	Ash
Saudi-Bangla nursery feed	89.96	30.20	11.60	9.60	25.90	22.68

[1]Nitrogen free extract (NFE) was calculated as 100-% (moisture+crude protein+crude fiber)

Sampling

The fish were sampled at 15 days interval to determine the increase in their growth (length and weight). Sampling was done in the early morning when the fish stomach was about to be empty to avoid the biasness of weight due to presence of excessive feed. Ten (10) fish were randomly collected from each aquarium at 15 days interval. The weight (mg) was taken in an analytical balance (College B204S, Switzerland) and the length (mm) was measured by placing the larvae on a Petridish on a 1 mm graph paper.

Growth parameters

The following parameters were used to evaluate the growth:

1. Length gain (cm) = Average final length (mm) - average initial length (mm)
2. Weight gain (g) = Average final weight (mg) - average initial weight (mg)

The specific growth rate was calculated as the percentage of increase of body weight/day over given time interval by the following equation (Ricker 1979):

3. Specific growth rate(SGR)= $(\ln W_2 - \ln W_1)/(T_2 - T_1) \times 100$

Where, W_2= final live body weight (g) at time T_2

W_1=final live body weight (g) at time T_1

Survival rate

The experiment was terminated at 90th day and the fish were harvested from each of the aquarium and the final growth and survival of fries were estimated. The survival rate was estimated by subtraction of the finally harvested fry from initial stocking fries which was divided by 100.

Water quality parameter

Temperature, dissolved oxygen (DO) and pH of water in each aquarium under each treatment were recorded on sampling dates. Temperature was recorded by using a Celsius thermometer, DO was measured by a digital DO meter (Multi 340i/set, Germany) and pH was measured by a portable digital pH meter (MICRO-TEMP, pH 500).

Data analysis

The length gain (mm), weight gain (g), specific growth rate (SGR) and survival rate of fries during experimentation with different feeds were all tested using one way analysis of variance (ANOVA). Significant results ($P<0.05$) were further tested using DMRT (Duncan Multiple Range Test) to identify significant

differences among means. This statistical analysis was performed with the aid of the computer software MSTATC program.

RESULTS AND DISCUSSION

The growth of fish, specific growth rate (SGR) and survival rate of *B. gonionotus* during the experimentation are presented in Table 3.

Table 3. Growth parameters and survival rate of Thai sarpunti (*B. gonionotus*) fry after 90 days of experiment

Treatment	Initial size		Growth		SGR	Survival rate (%) (Average+-SE)
	Length(mm) (Average+-SE)	Weight (mg) (Average+-SE)	Length gain (mm) (Average+-SE)	Weight gain (mg) (Average+-SE)		
T_1	19.0±0.15[a]	90.0±0.05[a]	12.77±0.49[a]	216.6±1.85[a]	1.36±0.07[a]	75.71±1.43[b]
T_2	19.0±0.15[a]	90.0±0.05[a]	13.73±0.37[b]	293.36±7.26[b]	1.62±0.20[b]	81.9±2.18[c]
T_3	19.0±0.15[a]	90.0±0.05[a]	12.53±0.36[a]	204.2±3.05[a]	1.32±0.80[a]	68.57±1.42[a]

Values of the parameter in each column with different superscripts (a, b) differ significantly ($P<0.05$).

The highest length gain (13.73±0.37) mm and weight gain (293.36±7.26) mg was observed in T_2 and significantly ($P<0.05$) different from T_1 and T_3 (Table 3). Das *et al.* (1990) reported that the higher growth performance of common carp, *Cyprinus carpio* in hormone treated feed due to the entire reproductive energy was rechannelled for somatic growth, resulting in higher dressing weight. The commonly used rice bran (crude protein 13.3%) as supplementary feed showed higher growth performance of milk fish artificial culture (Santiago *et al.*, 1982) and duck-fish integrated culture system (Yakupitiage *et al.*, 1991). Kohinoor *et al.* (1993) reported that feeding with rice bran resulted significantly better production of *B. gonionotus* (2384 kg/ha/6 months) than that with fertilization (2128 kg/ha/6 months) treatments.

The highest SGR (1.62±0.20) was also observed in T_2 and followed by T_1 & T_3 (Table 3). The SGR value of T_1 and T_3 significantly different from T_2 but no significant variations in SGR between them. Wee and Ngamsnal (1978) obtained much lower SGR (%/day) values (1.27-1.85) in *P. gonionotus* fed varying dietary protein levels (15-55) under laboratory condition. The values obtained in the present study were closed the Wee and Ngamsnal (1978) reported values. This may be due to implementation of the experiment in the laboratory. Wee and Ngamsnal (1978) used dietary protein but live feed (plankton) with Saudi-Bangla nursery feed was used in the present experimentent.

The highest survival rate was observed in T_2 (81.9%) and followed by T_1 and T_3 (75.71 and 68.57% respectively). But there were a significant variation ($P<0.05$) in survival rate of *B. gonionotus* among all the treatments. Hossain *et al.* (1998) found 84% survival rate of Thai sarpunti in earthen pond. Yakapitiyage *et al.* (1991) reported that survival rate of Thai sarpunti was (47-92%) with supplementary feeding of fish in duck-fish integrated system. The relatively higher survival of *B. gonionotus* in the T_2 (81.9%) may be due to the supply of live feed with Saudi- Bangla nursery feed and also due to the continuous supply of aeration in aquarium resulted higher DO.

During the experimental period, the physicochemical parameters were not found any marked differences. The ranges of water quality parameters in different treatment during the study period were viz. temperature 27-27.5°C, pH 8.5-8.9, DO 5.7-5.8 mg/L and total alkalinity 68-80 ppm (mg/L) and the ammonia were ranged from 0.01-0.019 mg/L are presented in Table 4.

Table 4. Average water quality parameters at different treatments

Treatment	Temperature (°C)	pH	Dissolve oxygen (DO) (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)
T_1	27.5	8.9	5.70	68	0.019
T_2	26.8	8.5	5.75	75	0.015
T_3	27.0	8.8	5.80	80	0.010

No free $C0_2$ were detected in any aquarium during the experimental period. According to Jhingran (1983) the values of all these parameters were found suitable for fish farming. Ahmed (1997) reported that the minimum water quality to maintain fish health should be 5ppm, 6.7-8.6, <0.02 ppm and >20 ppm for DO, pH, ammonia and alkalinity respectively. In the present experiment water quality parameters were properly maintained and fluctuations in them were kept minimum and also suitable due to close monitoring. Hence, the observed variation among treatments definitely due to the composition of the feed not for water quality parameters.

Table 5. Economic analysis of growth response of Thai sarpunti (*Barbodes gonionotus*) fry under laboratory condition at the end of study period

Parameters	Thai sarpunti (*Barbodes gonionotus*)
Total variable cost (Aquarium cost+fingerling cost+feed cost+hormone cost+additional cost)	2000
Total cost	2000
Total production (g)	750
Total fish recovered	560
Total income	2800
Net profit (Tk)	800
BCR	1.40

The cost of aquarium repairing, maintenance and fry were the same for each treatment. The net profits obtained 800 Tk.\28 days during the study period. Kohinoor *et al.* (1999) reported that net profit of Tk. /ha was 69,752 from Thai sharpunti (*Puntius goniontus*) culture of 6 months. The results of the present study support to the result of Kohinoor *et al.* (1999) due to higher market price and higher production of Thai sarpunti. The benefit cost ratios (BCR) of the present study was 1.40. This value close to Akter (2001) found value 1.90 in Thai pangas culture. A little deviation of Thai sarpunti regarding the findings of Akter (2001) might be due to laboratory sources, environment and different feeding regiems.

The results of the present study demonstrated that the using Saudi Bangla nursery feed over control measure have significant role in growth of *B. gonionolus* and it is also recommended that no need to use 17α-methyl testosterone with any supplementary feed. Just using of Saudi-Bangla nursery feed with regular fertilization is cost effective for the growth and survival of *B. gonionotus* in farmer's ponds in Bangladesh.

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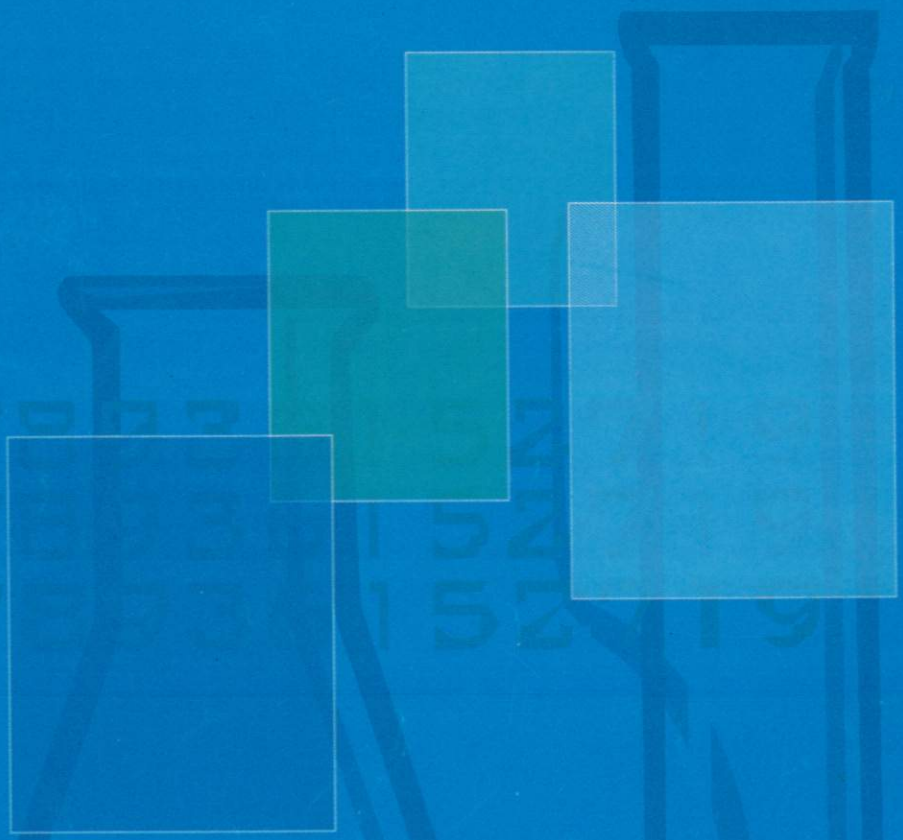

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