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Comparative growth performance assessment of Shing (*Heteropneustes fossilis*) feeding with prepared and commercial diet

Abstract

An experiment was carried out to understand the effect of prepare feed (T_1) compare with commercial feed (T_2) on growth performance of shing *(Heteropneustes fossilis* for a period of 5 months during 15 March to 15 August 2018 at the farmer's pond Sreepur, Gazipur*)*. Fish were stocked at 100 per decimal in both treatments with triplicate. Average initial stocking weight was 12gm. Over the study period physico-chemical parameters such as temperature, dissolved oxygen, pH, ammonia-nitrogen (NH_3-N) remained suitable for shing aquaculture. However, growth performances were remarkably influenced by feed category. Mean weight gain (g) of shing was 58.5±4.62 and 47.29±3.86, specific growth rate (%day^{-1}) were 1.23±0.04 and 1.00±0.03 in T_1 and T_2 respectively. On the other hand, food conversion ratio was 1.6±0.01and 1.8±0.01 and survival were 95.17±3.7 and 96.23±1.76 in T_1 and T_2 respectively. The findings of the present study revealed that the highest weight gain and lowest FCR was found in T_1 which dictates that quality feed stuff such as fish meal has a significant impact for better aquaculture production.

Keywords shing, growth performance, prepared feed, commercial feed, survival

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Introduction

With the growing demand for food fishes, the aquaculture sector in Bangladesh is significantly moving towards intensification. Due to rapid expansion of this booming industry both horizontally and vertically an exceptional rise in the demand of fish feed since the culture patterns has switched from minimum to maximum stocking density i.e. traditional to semi-intensive or intensive culture.[1] It is undeniable that, improve feed composition and better feed efficiency results in higher fish production, lower feed cost and waste production. To a large extent, the success of intensive and semi- intensive fish heavily relies on the implementation of appropriate feed. Fish feeds provide nutrients for optimal fish development and provide farmers with greater financial returns. One of the most important concerns in aquaculture is feed cost. Feed costs generally constitute the highest single operation cost of semi-intensive or intensive grow-out farming operation. The feed must provide maximum production efficiency at a minimum cost. The relative importance of growth rate and feed conversion efficiency will depend upon the quality and cost of feed concerning the market value of the farmed product. The unit cost of various types of feed and cost of fish production using each of this feed as well as the unit profitability of each system of fish production must be compared before one type of feed is selected. It is therefore of great importance to the fish farmers to utilize their investments in the feed as optimal as possible. The Asian stinging catfish or fossil cat, *Heteropneustes fossilis*, (Bloch, 1794) is an air-breathing catfish and commonly known as Shingi or Shing in various regions of Bangladesh. This species is very familiar not only for its delicious taste but also for its high nutritional and medicinal properties. It remains a high amount of iron and fairly high content of calcium compared to many other freshwater fishes.[1-19] This species is considered as a valuable food fish species and recommended as the diet for the sick and convalescents. As a lean fish it is very suitable for people for whom animal fats are undesirable.[17] In recent years, shing has become one of the most popular commercial cultivable species among the fish farmers but one of the main hindrances of this potential fish species is that it depends largely on commercial feed which is cost-effective for fish farmers. Furthermore, as there is no strict legislation by the government over control of feed quality and cost, there is a great possibility that the farmers may be deceived by using the commercial feeds without knowing their nutritive values as farmers shift gradually from hand-made feed to factory-made feeds. Nevertheless, no studies have been performed to compare the growth performance of this valuable fish species using prepared feed and then compared with the commercial feed. Therefore, the present study is designed to check and compare the growth performance of shing (*Heteropneustes fossilis*) using handmade and commercial feeds to get a better understanding of the effect of feed on their growth.

Materials and method

Duration and study site

The experiment was carried out for a period of 150 days form 15 March to 15 August, 2018 at the farmer's pond of Sreepur,Gazipur.

Pond preparation

Prior to start of experiment, several times netting and application of padmatop gas tablet were done to remove unwanted fishes from ponds. After renovation, liming was done at a standard rate of 1kg CaO per decimal. Lime was mixed with water and kept overnight and distributed on the pond surface early in the morning.

Experimental design

Six earthen ponds with the size of each of were14 decimal and average water depth of 1.5meter was used for the present study. The

ponds were categorized with two treatments such as T_1 and $T_2$with each having three replications. The fingerlings of shing were supplied by Adorsho Fish Hatchery in Trishal, Mymensingh and it was stocked at the rate of 100/decimal for each treatment.

Feeding of fish

Two types of feed were used during experiment. Prepared pellet feed treated as treatment 1 (T_1) including Mustard Oil Cake (MOC), Rice Bran (RB), Maize (M), Wheat Flour (WF) and Vitamin pre-mix (Vit.) whereas commercial pellet feed named "Mega Feeds Limited" treated as treatment 2 (T_2) were designed for the present study. Major ingredient of prepared feed was Fish Meal (FM) supplied by "Virgo Fish and Agro Process Limited" and the other five different types of feed elements were collected from local market. The proximate compositions of hand-made feed and Mega fish feed are given in the Table 1. Feed was delivered by spreading method manually twice or thrice in a day. First 14 days fish were fed at 12% of their body weight. Then, it was reduced to 5% next 16 to 45 days. Finally, last 46-150 days feeding rate was again increased at 12% of fish body weight. The power is adjusted based on the weight of the fish during sampling. Fish sampling was done randomly catching 15 fish from each tank every 15 days and the fish were caught with a cast net and the weight was taken by the weight of a precision balance (accurate to 0.1g).

Table 1 Proximate composition of prepared and Mega feed

Components	Amount (%) in Prepared Feed	Amount (%) of mega feeds starter fish feed	Amount (%) in mega feeds grower fish feed
Moisture	13.0	12.9	13.8
Crude protein	32.1	31.20	26.4
Lipid (Oil)	6.87	6.72	7.26
Ash	10.5	13.2	17.1
Crude Fibre	5.0	11.58	12.2

Water quality parameters

Throughout the experimental period, three major water quality parameters were recorded after every 15 days. Water quality measurements and sample collection were made between 9.00 and 10.00am on each sampling day. Dissolved oxygen, pH and ammonia-nitrogen (mg/l) were measured.

Analysis of growth parameters

To evaluate the fish growth and production, following parameters were used:

Weight gain (g)=Mean final weight (g)–Mean initial weight (g)

$$SGR\left(\%\ per\ day\right) = \frac{Ln\ final\ body\ wt. - Ln\ \text{int}ial\ body\ wt}{Day} \times 100$$

$$FCR = \frac{Total\ feed\ used}{Total\ weight\ gain} \times 100$$

$$Survival\ rate = \frac{No\ of\ fish\ harvested}{No.\ of\ is\ stocked} \times 100$$

Statistical analysis

For the statistical analysis of the data, a one-way ANOVA (Analysis of Variance) was done by using the SPSS (Statistical Package for Social Science) version- 16.0. Only percent data had to be arcsine transformed before analysis. Significance was assigned at the 0.05%level of significance.

Result and discussion

Water quality parameters

All of the water quality parameters recorded in both treatments was found more or less similar and almost all of them were within the desirable range for fish culture. During the experimental period, water temperature varied from 24 to 32°C in T_1 and 26 to 31°C in T_2 respectively. The highest temperature was 32°C which was found in T_1. However, during the first week of July temperature was jumped from 26 to 32°C.[5,6] recorded temperature ranged from 22 to 29.5°C and 17 to 33.5°C, respectively which was more or less similar than the findings of the present study[21] reported that water temperature varied from 25.60 0C to 33.00°C in farmers carp polyculture ponds, which is almost similar with the value of the present study. The dissolve oxygen content of the water was varying from 3.44 to 7.58mg/L in T_1 and 3.56 to 7.46mg/L in T_2, respectively. However, the statistical analysis showed that a significant difference ($P<0.05$) was found between the means values of dissolved oxygen which were 5.95mg/l and 5.19mg/L in both treatments. It may be due to difference in temperature, decomposition rate; turbidity etc.[9] reported that the range of dissolved oxygen suitable for fish culture would be 5.0 to 8.0mgl^{-1}. The concentration of dissolved oxygen in the present study was also similar to the findings of [2,3,12] and[5] who recorded dissolved oxygen ranged from 4.0 to 7.0, 2 to 7.04, 3.4 to 8.1, 4.3 to 6.9 and 1.2 to 7.2mgl^{-1}, respectively which indicates that the range of DO was within the suitable range for fish production. In the present experiment, the value of pH was found 5.89 to 10.8 T_1 and 7.12 to 10.23 T_2. The statistical analysis showed that there was no significant difference ($P>0.05$) found among the treatments. In an investigation from summer to winter season conducted in Kailla oxbow Lake of Mymensingh, pH value was found 7.15 to 7.60 which was slightly lower than the present study[4,10] reported pH from 7.50 to 8.00 in five prawn ponds, which are almost similar with the findings of present experiment. The mean pH values observed in the present study were slightly alkaline in both treatments, which dictate that study ponds were highly productive and congenial for fish culture.

The range of NH_3-N in the present study was varying between 0.24 to 0.93 T_1 and 0.12 to 0.69 T_2.The statistical analysis showed

that there was no significant difference (P>0.05) found among the treatments.[16] revealed that ammonia-nitrogen value ranged from 0.01 to 0.82mgl^{-1} and 0.203 to 0.569 mgl$^{-1,}$ respectively.[8] found that the value ranged from 0.50 to0.62mg/L in extensive management of Chinese and Indian major carps, which was lower than the findings of present study (Table 2).

Table 2 Water quality parameters with mean (±SE) in all treatments during the study period

Parameters	T_1	T_2	Level of significance
Temperature (0°C)	28.08±2.58	28.40±2.03	NS
Dissolve oxygen (mg/l)	5.95^a±1.18	5.19^b ±1.04	**
pH	8.46±1.31	8.57±1.22	NS
Ammonia (mg/l)	0.55±0.33	0.49±0.29	NS

Values with the same superscript are not significantly different at p>0.05

Growth and production of Shing, *Heteropneustes fossilis*

Growth, production and survival of shing (*Heteropneustes fossilis*) during study period are shown in Table 3.The mean stocking weight of shing was equal in T_1 and T_2 treatments which weighed about 12g. The mean harvesting weight of shing was 70.5±4.62g, 59.29±3.86g, in T_1 and T_2 treatments, respectively. The result showed that the mean weight gain of shing at the end of the experiment was 58.5g, 47.29g in T_1 and T_2 respectively which was significantly different (p<0.05) from each other. Mean length of shing at the end of this study was presented in Figure 1. It is observed from the experiment that, handmade feed is more preferable than industrial feed for the fish growth. The highest mean weight gain in T_1 might be due to use of good quality protein source and fish might use it appropriately. The food conversion ratio (FCR) of shing fish species at different treatments was observed at 1.6±0.01 and 1.8±0.01 in T_1 and T_2 respectively which was differ significantly. The highest FCT was found in T_2 (1.88) while the lowest was in T_1 (1.6). [15]

Table 3 The growth parameters of (*Heteropneustesfossilis*) observed during the study in both treatments

Parameters	T_1	T_2	Level of significance
Mean Stocking Weight (g)	12±0.00	12±0.00	NS
Mean Harvesting Weight (g)	70.5^a±4.62	59.29^b±3.86	**
Mean Weight Gain (g)	58.5^a±4.62	47.29^b±3.86	**
Specific growth rate (% day $^{-1}$)	1.23±0.04^a	1.00±0.03^b	**
Food conversion ratio (FCR)	1.6^a±0.01	1.8^b±0.01	**
Survival	95.17 ± 3.79^a	96.23 ± 1.76^a	NS

Values with the same superscript are not significantly different at p>0.05

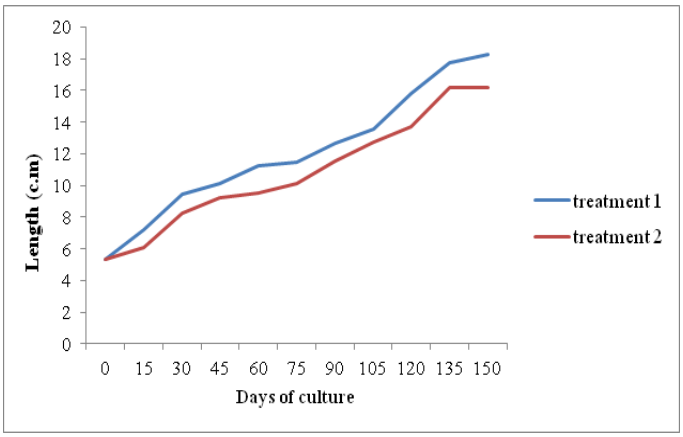

Figure 1 Mean length of Shing (*Heteropneustes fossilis*) in two treatments over study period.

Conducted a six week growth trial using glass aquariums on shing fish and found that the conversion ratio was 1.8 while using pelleted feed which was very close to the findings of the present study. From the result of the experiment, it can be mentioned that being a carnivore by virtue shing could perform better growth on protein which is form animal source. Specific growth rate (SGR) of shing was 1.23%day^{-1} and 1.00%day^{-1} in T_1 and T_2 respectively. The highest SGR value (1.23) was recorded in T_1 while the lowest (1.00) was obtained in T_2.[11] was recorded the highest SGR (1.80) of *H. fossilis* by supplying diet which was very higher than the findings of present study of with our finding values.[18] Showed that, in treatment A, 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 while 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 which was very similar to the outcomes of this study.[14] 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. The SGR% value of shing fish in present investigation matching the same trend mentioned in[13] fifth law. The survival was 95.17 and 96.23 in T_1 and T_2 respectively. The highest survival was obtained in treatment T_2(96.23 %) and the lowest was in treatment T_1 (95.17 %) and there was no significantly different between two treatments.[15] also got 100% survival rate of *Heteropneustes fossilis* in a study with formulated pelleted feed which was more or less similar to the output of present study[18] reported that survival rates were 93.33% at the end of 15, 35 and 60 days in treatment A while in treatment B, it was 93.33% at the end of 15 & 30 days and 90% at the end of 60 days which was lower than the present study.

Conclusion

Shing *(Heteropneustes fossilis*) is an attractive and popular species to the people of Bangladesh due to delicious and nutritious food value. In the present study, highest weight gain observed in treatment 1with lower FCR 1.6. By considering the highest weight gain and lowest FCR from this study, we can conclude that treatment 1 (hand-made feed) might be the best shing culture technology in the seasonal ponds of farmers in Bangladesh to get higher production and net return.

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Conflicts of interest

The author declares that there are no conflicts of interest.

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References

1. Kader MA, Hossain, MA, Hossain MD et. al. A comparative study on the effect of commercial fish feeds on the growth of Thai pangas, *Pangasius hypophthalmus*. *Bang Fish Res.* 2007;(1):53–58
2. Ahmed H. Promotion of small indigenous fish species (SIS)–mola based Carp polyculture technology at Gazipur area of Bangladesh. MS dissertation, Dept of Fisheries Management, Bangladesh Agricultural University, Mymensingh, 2004;85 p.
3. AIam MJ, Hoq ME, Jahan DA, et. al. Nursery rearing of *Macrobrachium rosenbergii*(de Man) using hapa–nets: effects of stocking density. *Bangl J Fish Res.*1997;1(1):09–16.
4. Akter MN, Ahmed GU, Hossain MS et al. Seasonal Variation of Gill Pathology of a Climbing Perch in Lake Fisheries of Bangladesh. *Int J Anim Fish Sci.*2009;2(3):208–213.
5. Ali ML, Rashid MM, Ahmed SU, et. al. Effect of high and low cost brood feeds on the hatching and survival rate of freshwater prawn, *Macrobrachium rosenbergii* larvae. *J Bangla Agric Uni.*2004;2(1):135–139.
6. Alim MA. Developing a Fish Polyculture Technique for Farmers, Consumption and Cash Crop. Ph.D. Dissertation, Department of Fisheries Management, Bangladesh Agricultural University, Mymensingh. 2005;153 p.
7. Chakraborty BK, Nur NN. Growth and yield performance of shingi, *Heteropneustes fossilis* and koi, *Anabas testudineus* in Bangladesh under semi–intensive culture systems. *Int J Agril Res Innov Tech.* 2012;2(2):15–24.
8. Dewan S, Wahab MA, Beveridge MCM, et. al. Food Selection, Electivity and Dietary Overlap Among Planktivorous Chinese and Indian Major Carp Fry and Fingerlings Grown in Extensively Management Rain Fed Pods in Bangladesh, *Bangladesh J Fish*. 1991; 22:277–294.
9. DoF. Matshya Pokkha Sharanika (Written in Bengali).Directorate of Fisheries, Ministry of Fisheries and Livestock, People Republic of Bangladesh. 1996, p.132.
10. Hoq ME, Islam MM, Hossain MM, et. al. Polyculture of Freshwater Prawn (*Macrobracium rosenbergii*) With Chinese and Indian Carps In Farmer's Pond.*J Aquacult.* 1996;57:135–141.
11. Hossain MA, Parween S. Effect of supplementary feed on the growth of shingfish (*Heteropneustes fossilis*Bloch). *Bangl J Fish Res.* 1998;2(2):205–207.
12. Kohinoor AHM.*Development of culture technology of three small indigenous fish–mola, Amblypharyngodon mola, punti, Puntius sophore and chela, Chela cachius with notes on some aspects of their biology*. Ph.D. dissertation, Department of Fisheries Management, Bangladesh Agricultural University, Mymensingh. 2000; 363 p.
13. Medwars PB. Size, shape and age In: Essays on Growth and Form Presented to D' Arcy Went worth Thompson. Oxford University Press. 1954.
14. Minot CS. *The problem of Age, Growth and Death*. Murvey. London. 1908.
15. Niamat R, Jafri AK. Growth response of the siloroid, *H. fossilis* Bloch, fed pelleted feed. *Aquaculture*. 1984;37(3):223–229.
16. Rahman SMS. Effect of stocking density of gift strain of nile tilapia *(Orechromisniloticus)* and freshwater prawn *(Macrobrachium rosenbergii)* in periphyton based production system. MS. dissertation, Dept. of Fisheries Management, Bangladesh Agricultural University, Mymensingh. 2005. 84 p.
17. Rahman MA, Gheyasuddin H, Rasid MH, et al. Proximate composition and native quality of freshwater Zeol fishes of Bangladesh. *Bangladesh J Fish*. 1982;25:37–43.
18. Rahman S, Monir MS, Khan MH. et. al. Culture potentials of climbing perch Thai koi, *Anabas testudineus*(Bloch) under different stocking densities in northern regions of Bangladesh. *J Experi Bio Agricul Scien*. 2013;1(3):203–208.
19. Saha KC, Guha BC. Nutritional investigation on Bengal fish. *Indian J Med Res.* 1939;26:921–927.
20. Shang YC, Costa–pierce BA. Integrated agriculture–aquaculture farming system–some economic aspects. *World MaruculSoc.*1983;14(1–4):523–530.
21. Uddin MA.*Effect of Addition of Small Fish on the Pond Ecology and the Production in Polyculture*. MS Thesis, Department of Fisheries Management, BAU, Mymensingh. 2002; 81 p.