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Growth performance of *Labeo rohita* H. and *Oreochromis niloticus* L. with varieties household feeds under tank condition

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Abstract: In this study, growth performance of indigenous fish species *Labeo rohita* was observed for two months and exotic fish species *Oreochromis niloticus* was observed for four months with varieties of household and manufactured feeds under tank condition. The fishes were reared in five different tanks providing with maize flour, mustard oil cake, wheat flour, dried fish powder and manufactured feed at different proportion to check their growth performances in weight and length. For both the fish species *L. rohita* and *O. niloticus*, the highest growth in length and weight was recorded with the mixture of wheat flour, mustard oil cake and dried fish powder feed; while the lowest growth in length and weight was observed in the controlled tank. The overall growth in length and weight was followed the same pattern in case of *L. rohita* and *O. niloticus* and the growth performance can be ordered as following ascending order- control < mixture of maize flour and mustard oil cake < mixture of wheat flour and mustard oil cake < manufactured feed (pellet) < mixture of wheat flour, mustard oil cake and dried fish powder feed.

Keywords: Growth, household feed, manufactured feed, tank condition.

Introduction

In Bangladesh, fisheries sector plays a vital role in the national economy, supporting to the Gross Domestic Product (GDP). Fisheries sector contributes 3.52% to national GDP and around one-fourth (26.37%) to the agricultural sector of GDP. Fish and fisheries products contribute 1.39 percent to total export earnings (BER, 2020). Indigenous fish is one of the crucial elements of sound aquatic ecosystems as they arrange a dynamic portion of the aquatic food web and accomplish numerous significant ecological functions. About 260 species of freshwater indigenous fish are available in Bangladesh. To survive, these indigenous fish need appropriate habitation, good quality water and hygienic environment- free of residues and agrichemicals (Rahman, 1989). The current deficiency of animal proteins in many developing countries is accredited to the incongruity between the rate of growth in animal protein production and the rate of population growth. The population growth and animal protein production are therefore not relational. Additionally, the rise in human population together with varying insights on quality food has commanded to amplify more demand for fish.

The State of World Fisheries and Aquaculture 2018, Bangladesh ranked 3rd in inland open water capture production and 5th in world aquaculture production. Bangladesh achieved self-sufficiency in fish production with a per capita fish consumption of 62.58 g/day against set target of 60 g/day according to FAO report (BER, 2020).

The carp fish species *Labeo rohita* (Hamilton) commonly known as Rohu belongs to Order: Cypriniformes and

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Family: Cyprinidae - is one of the most common fish species cultured in the Indian subcontinent. It is very delicious and admired fish species among other major carps available in this region (FAO, 2000). *Oreochromis niloticus* commonly known as Nile tilapia belongs to the Order: Perciformes and Family-Cichlidae. It is considered as one of the most important freshwater fish species for commercial aquaculture owing to its high speedy growth rate, nutritional potentials and resistance ability against diseases (Mapenzi and Mmochi 2016; Abd *et al.* 2016). The practice of using commercial feed has become very popular for getting quick success in cyprinid culture under exhaustive conditions of the main rohu together with other carp fishes (Abid and Ahmed, 2009). Because of the lack of suitable evidence about the effectiveness of household and manufactured feeds, the current study was conducted. The growth efficacy of Rohu and Nile Tilapia with household feed- maize flour, mustard oil cake, wheat flour, dried fish powder and manufactured feeds at different mixed proportions has been evaluated.

Materials and method

Study place and period

The study was conducted during the period November 2018 to December 2018 for *L. rohita* and March 2019 to June 2019 for *O. niloticus* at field laboratory of Department of Zoology, University of Rajshahi, Bangladesh.

Collection and transformation of fish

The fingerlings of both specimens were collected from different nursery pond of Rajshahi. The collected specimens were transported in a plastic container from nursery pond to field laboratory of Department of Zoology, University of Rajshahi.

Measurement of length and weight

The total length was recorded in centimeter (cm) with the help of a “Measuring Board” fitted with a meter scale and weight of the fishes were taken in gram (gm) with the help of digital electric balance, model ‘ELB120’ manufactured by Shimadzu Corporation (Table 1, 2).

Experimental Design

Tank preparation

The feeding experiments were conducted in separate tanks for each type of household and manufactured feeds. The tanks were made of bricks and cement. The size of each tank was 2.5 × 2.5 × 1.75 feet for length, width and height accordingly. Tap water was the main source of supplying water into the tanks. Arrangements were made properly to ensure adequate oxygenation by electric air pump machine.

Diets and mode of feeding

Four different mixtures of different household feeds were given to the experimented fishes. These were mustard oil cake, maize flour, wheat flour and dried fish powder. All these household elements and manufactured feeds were procured from Saheb Bazar, Rajshahi, but dried fish powder is prepared by researcher. In case of the both specimens *L. rohita* and *O. niloticus*, the given feeds were- mixture of maize flour 70% + mustard oil cake 30% in Tank-01; mixture of wheat flour 60% and mustard oil cake 40% in Tank-02; commercial feed pellets in Tank-03; mixture of wheat flour 50%, mustard oil cake 20% and dried fish powder 30% in Tank-04. While the growth was observed in Tank-05 as control (provided no feed but probably contain natural food like algae). The feeds were supplied twice daily morning and evening in pellet form.

Prior to formulate pellet feed, all the elements were finely powdered.

Statistical analysis

The final body weights and lengths were obtained of *L. rohita* and *O. niloticus* upto completion of the experiment *i.e.,* 60th day for *L. rohita* and 120th for *O. niloticus*. The growth rate (%) was calculated as given below:

$$\text{Growth rate (\%)} = \frac{\text{Final measurement} - \text{Initial measurement}}{\text{Initial measurement}} \times 100$$

Table 1: Initial length and weight of *L. rohita*

Sps. No.	Tank-01		Tank-02		Tank-03		Tank-04		Tank-05	
	TL (cm)	TW (g)	TL (cm)	TW (g)	TL (cm)	TW (g)	TL (cm)	TW (g)	TL (cm)	TW (g)
1	4.50	6.00	9.00	9.50	8.70	9.80	10.00	9.00	9.40	10.00
2	5.00	6.50	10.50	12.00	11.60	13.00	9.40	8.00	10.10	14.20
3	7.50	8.60	12.00	13.50	11.00	12.90	8.90	7.50	11.50	14.20
4	8.20	9.00	10.50	12.00	10.50	12.50	10.20	9.00	10.50	12.40
5	8.80	10.00	11.00	12.60	12.30	13.70	11.40	10.50	12.00	14.90
6	7.00	8.20	10.50	12.00	9.40	10.80	9.00	8.00	10.00	13.00
7	7.50	8.60	9.40	11.00	9.80	11.10	10.40	9.80	8.80	11.10
Avg.	6.93±1.60	8.13±1.40	10.41±0.99	11.80±1.26	10.47±1.26	11.97±1.41	9.90±0.88	8.83±1.07	10.33±1.12	12.83±1.79

Table 2: Initial length and weight of *O. niloticus*

Sps. No.	Tank-01		Tank-02		Tank-03		Tank-04		Tank-05	
	TL (cm)	TW (g)	TL (cm)	TW (g)	TL (cm)	TW (g)	TL (cm)	TW (g)	TL (cm)	TW (g)
1	10.50	17.50	10.30	18.00	10.00	16.00	10.40	18.00	12.00	17.50
2	11.10	19.00	10.80	17.00	11.50	20.00	11.00	20.00	12.50	18.00
3	11.40	19.00	11.00	19.00	11.80	21.50	11.40	21.00	12.60	18.00
4	11.50	20.00	11.50	20.00	11.90	25.00	11.50	21.50	12.80	19.50
5	11.70	22.50	11.60	21.00	12.00	24.50	12.00	23.10	13.00	22.50
6	12.20	24.50	12.30	24.00	12.10	25.50	12.30	25.30	13.50	25.00
7	12.50	26.00	13.10	28.00	13.40	32.50	12.50	26.50	14.00	26.00
8	13.00	27.00	14.00	30.00	13.70	33.50	13.40	29.00	14.20	16.30
Avg.	11.74±0.80	21.94±3.58	11.83±1.24	22.13±4.74	12.50±1.14	24.81±5.93	11.81±0.94	23.05±3.66	13.08±0.76	20.35±3.67

Results

Growth performance of *L. rohita*

From Table 3, in case of *L. rohita,* it is observed that the highest growth in length and weight was recorded in Tank 4 where the mixture of wheat flour, mustard oil cake and dried fish powder feed was given in the ration of 5:2:3. On the other hand, the lowest growth in length and weight was found in the specimens of Tank 5 which was control. For *L. rohita*, the overall growth performance in length and weight can be ordered as following descending order- mixture of wheat flour, mustard oil cake and dried fish powder feed > manufactured feed (pellet) > mixture of wheat flour and mustard oil cake > mixture of maize flour and mustard oil cake > control.

Growth performance of *O. niloticus*

From Table 4, in case of *O. niloticus*, the highest growth in length and weight was found fish in Tank 04 with mixture of 50% wheat flour, 20% mustard oil cake and 30% dried fish powder feed, while the lowest growth in length and weight was observed in the tank which was control. The growth performance can be ordered as following descending order- mixture of wheat flour, mustard oil cake and dried fish powder feed > manufactured feed > mixture of wheat flour and mustard oil cake > mixture of maize flour and mustard oil cake > control.

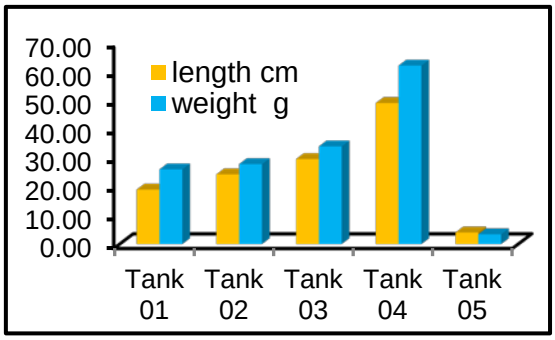

Fig.1. Growth rate of *L. rohita* among the different tanks using different feeds

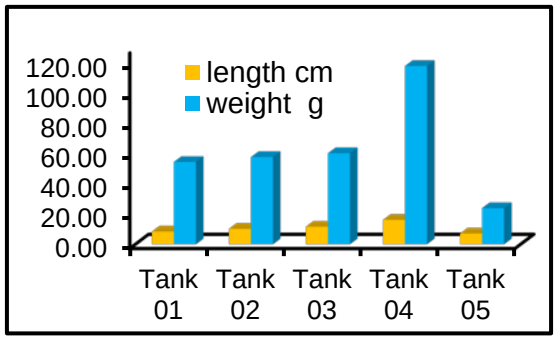

Fig. 2. Growth rate of *O. niloticus* among the different tanks using different feeds

Table 3: ANOVA results with four types of different feeds provided on *L. rohita.*

SUMMARY						
Groups	***Count***	***Sum***	***Average***	***Variance***		
Tank-01 Feed	7	14.9	2.129	0.042		
Tank-02 Feed	7	23	3.286	0.071		
Tank-03 Feed	7	28.5	4.071	0.996		
Tank-04 Feed	7	55.8	7.971	2.839		
ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between feeds	134.813	3	44.938	45.523	4.65E-10	3.009
Within feeds	23.691	24	0.987			
Total	158.504	27				

Table 4: ANOVA results with four types of different feeds provided on *O. niloticus*.

SUMMARY						
Groups	***Count***	***Sum***	***Average***	***Variance***		
Tank-01 Feed	8	86.5	10.813	25.781		
Tank-02 Feed	8	86.5	10.813	26.781		
Tank-03 Feed	8	105	13.125	32.125		
Tank-04 Feed	8	355.6	44.45	33.043		
ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between feeds	6509.828	3	2169.943	73.726	2.1E-13	2.947
Within feeds	824.113	28	29.433			
Total	7333.94	31				

Discussion

Byproducts and surpluses of various crops are being reused as fish feed in Bangladesh. Some well-known fish feed ingredients are maize flour, dried fish powder, rice bran, fish meal, broken rice, mustard oil cake, pulse, soybean oil cake, snail shell meal, wheat bran etc. (Mahmud *et al*, 2012). In this present study, the household feed- maize flour, mustard oil cake, wheat flour, dried fish powder and manufactured feeds (as pellet form) were fed at different mixed proportions to the fish species of *L. rohita* and *O. niloticus*. The results of the present study received support from the experiment done on growth performance with different supplementary diets to different fish species conducted by previous researchers (Rahman *et al.* 1999; Abbas *et al.* 2010). The outcome of this study is compatible with the previous study done by Ahmad (1957) and Huet (1989), who discovered that fish growth is highly enhanced by using different household foods in different formulations as additional feed. The findings of this study are supported by the study of Abid and Ahmed, (2009 a and b) and Ashraf *et al*., (2008) whom studied the growth performance of *Labeo rohita* fingerlings with artificially composed diets. A substantial growth response was found by Li *et al*., (2000) in *Ictalurus punctatus* (channel catfish) when supplied various proteinous artificial feeds. The results of the growth performance study in case of *O. niloticus* are in line with the previous work of Workagegn *et al*. (2014) and Azzaza *et al*. (2008) who reported that different types of diets formulated from varieties of feed ingredients can be potential feed for the growth of *O. niloticus*. Islam *et al*. (2008) and Azim *et al.* (2002) also reported that the growth performance of carp fingerlings is significantly influenced by different artificial diets such as vegetable oil, mineral, fish meal, rice bran mixture and soybean meal vitamin. The findings of this study are in agreement with Jhingran (1991), who stated that additional feed significantly increased the fish growth and survival in rearing ponds and nursery culture systems.

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