GROWTH CHARACTERISTICS OF *Oreochromis mossambicus* FED WITH TWO DIFFERENT CONCENTRATIONS OF BROILER WASTE

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ABSTRACT

An investigation was carried out to study the growth characteristics and feed utilization of Oreochromis mossambicus fed with two different concentrations of broiler waste. two experimental feeds were prepared by replacing the constituents of control feed at 6.25, 12.5gm/100 gm respectively. Oreochromis mossambicus in the control and treatments were the respective feeds for a period 45 days. On 15th, 30th and 45th day after treatment growth parameters such as final weight, weight gain rate, growth rate, relative growth rate and specific growth rate, survival rate were observed. The data obtained were analysed using one way analysis of variance (ANOVA). The fishes fed with 12.5gm/100gm feed showed significantly higher (p<0.05%) growth rate of when compared to control.

Keywords: Oreochromis mossambicus, Broiler waste, Growth parameters.

1. INTRODUCTION

Aquaculture is the fastest growing systems in the world, which has arisen as an industry possible to supply a cumulative percentage of the total production of protein rich food such as fish and shellfish for human consumption throughout the world (Prasad, 1996). Aquaculture practices involved using high-quality feeds with high crude protein content which should contain not only essential nutrients but also complimentary additives to keep organism healthy and result in good growth performance (Hardy, 1995).

Global fishery production has been bowed up to be 142 million tonnes in 2008 and the benefaction of aquaculture was more than 60 % (FAO, 2010). The total fisheries production continued to grow rising from 34.50 % in 2006 to 36.90 % in 2008. It has been estimated that the total fish production will be 53.64 million metric tonnes in 2030, based on annual growth rate. India now ranks second and third in world fishery production and freshwater aquaculture respectively (FAO, 2010). *O. mossambicus* have been used for aquaculture to afford food for populations around the globe as it was a relatively easy species to breed and rear for food. They also can tolerate a large range of environmental factors such as temperature, salinity, pH and more. However, in 1980s, the use of *O. mossambicus* declined as it was discovered that their growth could be naturally stunted and result in a less productive harvest.

Poultry by product meal (PBM) has been exposed to be of high nutritional quality and it is considered as a valuable source of protein for many species, especially for carnivorous fish species (Nengas, Alexis & Davies 1999). Poultry by-product meal (PBM) may help to diminish feed costs, although these sources may be lower in digestibility, palatability and essential amino acids (Barlow, 1997; Hertrampf and Piedad-Pascual, 2000; Emre *et al.*, 2003; Hu *et al.*, 2008). Poultry by product meals are rendered by product from the poultry processing industry. It has high potential to be combined in the diet of carnivorous fish species such as groupers due to its high protein content and lower price compared to fish meal. The terrestrial animal by-products such as poultry by product meal and meat and bone meal have high protein contents and appropriate essential amino acid (EAA) profiles (Tacon, 1993).

Therefore, in the present study an attempt is made to be observe the effect of broiler waste by incorporating it with formulated diet and feeding to the fish *Oreochromis mossambicus* followed by analyzing the growth parameters and feed utilization parameters.

2. MATERIALS AND METHODS

2.1.1. SELECTION OF EXPERIMENTAL FISH: *Oreochromis mossambicus*

PLATE – 1

2.1.2. Collection and maintenance of experimental fish:

O.mossambicus weighing 7±0.5 gm two (advanced fingerlings) for growth study were procured from, Mekkara fish farm, Thrissur district, Kerala,India. The fishes were judiciously carried from farm to the laboratory of our college in covers with water and well aerated oxygen. They had been acclimatized to laboratory prerequisites in cement tanks for about two weeks in non- chlorinated water. The fishes stood fed with prepared control feed once in a day. During the acclimatization period the water used to be changed (1/3 of water) every day to evade accumulation of faecal material and to prevent microbial contamination.

PLATE – 2

2.2. Preparation of feed:

The feed components used in fish feed preparation were wheat flour, coconut oil cake, soya meal, broiler waste and corn flour (binding agent). All were in the powdered form and broiler waste in the pasted form at different graded level. These substances were assorted thoroughly with hot water and that was cooked for 30 minutes and then cooled at room temperature for 30 minutes to and pellets were prepared by using domestic appliances with 0.5mm diameter. The feed without broiler waste (C – control) and the feed with broiler waste (T_1- broiler waste 6.25 %, T_2- broiler waste 12.5%). The small pellets were dried out and stowed in the refrigerator**.**

TABLE 1

TREATMENTS	BROILER WASTE (gm)	SOYA MEAL (gm)	WHEAT FLOUR (gm)	OIL CAKE (gm)
CONTROL	-	50	50	25
T1	6.25	46.875	23.475	23.475
T2	12.5	43.75	21.875	21.875

2.3. Experimental design:

The fresh water edible fish, *O. mossambicus* (7±0.5 g) were introduced in 50 L aerated plastic troughs. The fishes were alienated into two experimental groups (C – control and T_1 to T_2 – Two different treatments). Each treatments includes 4 fishes. This experimentation was passed out for a period of 45 days. During experimental period the fishes were fed with their respective feed at 5% of their body weight, once in a day. The medium (water) was altered daily in order to avert microbial contamination by replacing one-third of the water in the tanks daily throughout the experimental period after siphoning out the unutilized feed and faecal matter. The plastic troughs were washed and cleaned once in fifteen days when the fishes were removed from troughs for weighing. The survival rate was scrutinized during experimental period.

2.4. Determination of growth parameters:

The weight of *O. mossambicus* in the control and two different treatments were measured individually and values were noted.
The fishes were weighed by using digital electronic balance with mg sensitivity. The fingerlings were released into water after body measurements (Hasan and Khan, 2013). The weight of individual fish was recorded initially and then at 15 days interval for 45 days. BW, FW, GR, SGR and RGR were calculated in the control and treated fishes by using standard formula (Petursewiez and Macfutyen, 1970).

- Final weight (FW)(gm)
- Weight gain (WG) (gm) = FW(gm) – IW (gm)
- Growth rate (gm.day-1) = FW(gm) – IW (gm)/ No. of days
- Relative growth rate (RGR) (%)= 100 x [FW (gm) – IW (gm)] / IW (gm)

- Specific growth rate (SGR)(% day-1) = 100 x [In FW (gm) – In IW (gm)] /No. of days
- Survival rate (%) = 100 x Initial number of fishes – final number of fishes

2.5. Statistical analysis

The results of the whole study on growth characteristics of *Oreochromis mossambicus* fed with broiler waste feed were analysed statistically using one - way Analysis of Variance (ANOVA) and level of significance was defined at ($P \leq 0.05$).

3. RESULTS

3.1. Growth parameters

The broiler waste at two different concentrations (6.25,12.5 gm/kg of feed) as feed supplement to *O. mossambicus* for 45 days. The growth parameters such as final body weight, Growth rate, Relative growth rate, Specific growth rate and Survival rate of *O. mossambicus* in the control and two different treatments were observed initially and on 15th, 30th and 45th days after treatment and the results obtained are presented in table.

3.1.1. 15th Day After Treatment (DAT)

Growth characteristics of *O. mossambicus* fed with broiler waste as replacement feed at two different concentrations (6.25, 12.5, gm/kg of feed) after 15 days of treatment are presented in table 2. After 15 days of treatment, significant differences ($p < 0.05$ %) was noted in the body weight of *O. mossambicus* fingerlings treated with broiler waste feed (T_1 – T_2). Final body weight of fishes was higher (8.51±0.87gm) in T_2 group when compared to control (7.26±0.09gm). The weight gain was maximum (1.43±0.78gm) in T_2 group whereas control recorded a minimum weight gain of (1.22±0.08gm). The highest growth rate (0.92±0.13gm/day) was recorded in T_2 when compared to control (0.32±0.12 gm/day). Relative growth rate % was significantly higher ($P < 0.05$%) (24.56±13.77 %) in T_2 group when compared to control (16.23±5.78%). Specific growth rate % was high (4.35±0.28) in T_2 group whereas control recorded a minimum value of 3.46±0.51%. The survival rate during the experimental period was high in all the treatments (T_1 – T_2) when compared to control. The highest survival rate (100%) was observed in all treatments including control.

An overall, after 15 days of treatment the growth parameters was significantly high ($P < 0.05$) in *O. mossambicus* fed with broiler waste feed at four different concentrations (6.25, 125, 25, gm/kg of feed) when compared to control group.

TABLE - 2

TREATMENTS	Final body weight (gm)	Body weight gain (gm)	Growth rate (gm/day-1)	Relative growth rate (%)	Specific growth rate (%)
CONTROL	7.26±0.09	1.22±0.08	0.32±0.12	16.23±5.78	3.46±0.51
T_1	7.33±1.02	1.55±0.77	0.77±0.25	19.78±10.25	4.02±0.64
T_2	8.51±0.87	1.43±0.78	0.92±0.13	24.56±13.77	4.35±0.28

3.1.2. 30th Day after treatment (DAT)

Growth characteristics of *O. mossambicus* fed with broiler waste feed at two different concentrations (6.25,12.5 gm/kg of feed) after 30 days of treatment are presented in table 3. After 30 days, significant differences (P<0.05%) was noted in the BW of *O. mossambicus* treated with broiler waste replacement feed (T_1 –T_2). Final body weight of fishes was higher (8.64±1.05 gm) in T2 group when compared to control (7.12±0.73 gm). The weight gain was maximum (1.59±1.10 gm) in T_2 group whereas control recorded a minimum weight gain of (1.55±0.45gm). The highest growth rate (0.98±0.08gm/day) was recorded in T_2 when compared to control (0.76±0.09 gm/day). RGR % was significantly high (P<0.05%) (28.22 ±1.67%) in T2 group when compared to control (19.91±10.33%). Specific growth rate % was high (4.77±1.09%) in T_2 group whereas control recorded a minimum value of (3.58±0.22%). The survival rate during the experimental period was high in all the treatments (T_1 – T_2) while compared to control. The survival rate was high (100%) in all treatments including control.
An overall, growth parameters was significantly high (P<0.05) in *O. mossambicus* fed broiler waste feed at two different concentrations (6.25,12.5 gm/kg of feed) when compared to control group after 30 days of treatment.

TABLE - 3

TREATMENTS	Final body weight (gm)	Body weight gain (gm)	Growth rate (gm/day-1)	Relative growth rate (%)	Specific growth rate (%)
CONTROL	7.12±0.73	1.55±0.45	0.76±0.09	19.91±10.33	3.58±0.22
T_1	7.56±0.96	1.63±1.07	0.82±0.18	22.36±10.24	4.35±0.21
T_2	8.64±1.05	1.59±1.10	0.98±0.08	28.22±1.67	4.77±1.09

3.1.3. 45th Day After Treatment (DAT)

Growth characteristics of *O. mossambicus* fed with broiler waste as replacement feed at two different concentrations (6.25,12.5 gm/kg of feed) after 45 days of treatment are presented in table 4. After 45 days, significant variations (P<0.05%) was noted in the BW of *O. mossambicus* treated with broiler waste feed (T_1 –T_2). Final body weight of fishes was higher (8.76±1.62 gm) in T_2 group when compared to control (7.45±1.21 gm). The weight gain of was maximum (2.20±0.34 gm) in T_2 group whereas control recorded a minimum weight gain of 1.68±0.78gm. The highest growth rate (1.10±0.17 gm/day) was recorded in T_2 when compared to control (0.52±0.03 gm/day). RGR% was significantly (P<0.05%) higher (28.11±0.87 %) in T_2 group when compared to control (19.68±12.24%). Specific growth rate % was high (4.88±0.46%) in T2 group whereas control recorded a minimum value of 3.98±0.45%. The survival rate during the experimental period was high in all the treatments (T_1 – T_2) including control.

An overall, growth parameters was significantly high (P<0.05) in *O. mossambicus* fed with of broiler waste feed at four different concentrations (6.25, 12.5, 25, 50 gm/kg of feed) when compared to control group after 45 days of treatment.

TABLE – 4

TREATMENTS	Final body weight (gm)	Body weight gain (gm)	Growth rate (gm/day-1)	Relative growth rate (%)	Specific growth rate (%)
CONTROL	7.45±1.21	1.68±0.78	0.84±0.16	19.68±12.24	3.98±0.45
T_1	7.88±2.41	1.87±1.09	0.96±0.04	23.05±9.34	4.63±0.51
T_2	8.76±1.62	2.20±0.34	1.10±0.17	28.11±0.87	4.88±0.46

4. DISCUSSION

The present study showed that substantial increase in body weight, weight gain, weight growth rate, specific growth rate, relative growth rate, in *O. mossambicus* fed with broiler waste replacement diet. The enhancement in overall growth performance of the experimental fishes might be due to finding the protein content, fat content, phosphorus, calcium contents in the chicken waste in-corporated feed. These findings were analogous to the findings of Goda *et al* 2007, who observed increased body weight gain, specific growth rate, feed utilization efficiency in African catfish, *Clarius gariepinus* fed with supplemented diet encompassing poultry by product meal. Baboli *et al*., 2013 quantified that Rainbow trout fingerlings fed with poultry by product meal showed significance difference in weight gain, specific growth rate and he recommended that poultry meal can be swapped 50% or more of fish meal in the diet of Rainbow trout deprived of having any adverse effects. Hernetz *et al* and Pine *et al*.,2015 specified the poultry by product has been revealed to boost the growth performance of Nile tilapia and sunshine bars. Yones and Metwalli *et al*., 2015 stated that the uppermost growth performance parameters (final weight, body weight gain, daily weight growth, specific growth rate) were chronicled with poultry by product meal at 100 percent and endorsed substitution of 100 percent fish meal in juvenile nile tilapia.

5. CONCLUSION

On 15th, 30th, 45th, (DAT) the fishes fed with T2 feed showed a maximum increase in final body weight, weight gain, growth rate, relative growth rate, specific growth rate. The highest survival rate (100%) was observed in all treatments including control. Feed prepared from broiler waste at two different concentrations (6.25, 12.5 gm/kg of feed) is optimum for enhancing growth. So, the present study proves the possibilities of using the broiler waste in the preparation and production of fish feed.

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