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EVALUATION OF DIFFERENT FEEDING FREQUENCIES ON GROWTH PERFORMANCE AND FEED UTILIZATION OF *Clarias gariepinus* (Burchell, 1822). FINGERLINGS

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ABSTRACT
The experiment was conducted to assess the growth performance and feed utilization of Clarias gariepinus under the feeding frequencies of T1 (twice/day), T2 (thrice/day), and T3 (four times/day) at 3% BWD per day over a period of 56 days. A total of 180 fingerlings with average weight of 2.39±0.19g and average length of 5.02±1.04cm were stocked at 15 fish per plastic container of 35 litres capacity. The highest weight gain recorded at the end of the experiment was 7.39±0.19g in (T3) and the lowest was 5.35±0.31g in (T1). The highest specific growth rate (SGR%) value of 1.19±0.02 was recorded in (T3) and the lowest 1.01±0.03 was recorded in (T1). T3 recorded the highest FCR value of 1.88±1.37, while the lowest value of 8.34±2.12 was obtained in (T1). Therefore, Treatment 3 yielded the best performance in terms of WG, SGR, and FCR and can be recommended for enhanced growth performance and optimum feed utilization.
Keywords; Fingerlings, feeding, frequency, growth, performance, utilization.

INTRODUCTION

One problem facing fish culturists is the need to obtain a balance between rapid fish growth and optimum use of the supplied feed (Gokcek *et al*, 2008). There is also the need to establish the effect of number of feeding frequency on feed management, nutrient utilization and growth rate of fish. Since the feed cost accounts approximately 40-60% of the operating cost in intensive culture systems (Agung, 2004), the economic viability of the culture operation depends on the feed and feeding frequency. It means that nutritionally well-balanced diets and their adequate feeding are the main requirements for successful culture operation. Feeding frequency is one important consideration as it can affect growth, survival and fillet composition as well as water quality. Feeding also at the optimum frequency can result in tremendous savings in feed cost (Davies *et al*., 2006).

The amount of the daily feed intake, frequency and timing of the feedings and presentation of the predetermined ration are the key factors of feed management strategies, influencing the growth and feed conversion (Goddard, 1995; and Jobling, 1995). Optimal feeding frequency may vary depending on species, age, size, environmental factors, husbandry and feed quality (Goddard, 1995). Two or three feeding a day have been found to be sufficient for maximum growth of a number of different fish species (Ruohonen *et al*., 1998).

Efficient production and growth of fish depends on feeding the best possible diets at levels not exceeding the dietary needs (Charles *et al*., 1984). The ability of an organism to utilize nutrients especially protein will positively influence its growth rate (Sagbesan and Ugwumba, 2008). This study was therefore aimed at determining the best feeding frequency and feed utilization of *Clarias gariepinus* fingerlings.

MATERIALS AND METHODS

Study Location

The experiment was carried out at the hatchery complex of Bagauda Fisheries Research Institute, Kano, Nigeria. The study area lies between latitudes 11^0 20′ and 11^0 45′ North and longitudes 8^0 15′ and 8^0 30′ East.

Experimental Fish

Clarias gariepinus fingerlings of 2.39±0.19g average weight and 5.02±1.04cm average length were obtained from A4 Global Fisheries, a private consultancy outfit, behind school of nursing, Karkasara road, Kano and were acclimatized for a period of one week (7days) in 35L plastic containers and were fed a maintenance diet of (1.5mm) size commercial feed (Coppens) containing 45% crude protein. All fishes were weighed individually at the beginning and end of the experiment using Ohaus electric balance of 310g capacity. A total of 180 fishes were used for the experiment.

Tank Preparation and Water Supply

Twelve plastic containers of 35L capacity and circular in shape were used for the experiment. Uniform water level was maintained to compensate for water loss due to evaporation and the water was obtained from the University bore-hole.

Experimental Design & Layout

Three Treatments (T1, T2, and T3) replicated thrice were used for the experiment. The experiment was laid out in a Completely Randomised Block Design (RCBD) with fifteen (15) fishes stocked in each plastic of 35l capacity. The experiment was conducted over a period of eight weeks (56 days).

Feeding Rate & Frequency

Three Treatments at different feeding frequencies of T1 (twice/day; 9.00am and 12.00pm), T2 (thrice/day; 9.00am, 12.00pm and 3.00pm) and T3 (four times/day; 9.00am, 12.00pm, 3.00pm and 6.00pm) were allocated. Experimental diet (Coppens, 1.5mm) with 45% crude protein, was used at 3% body weight per day (BWD) for the study and the quantity of feed was adjusted weekly according to mean weight gain.

Length-Weight Measurement

Length measurement was carried out to the nearest centimeters using a measuring board graduated in centimeters. Total length (TL) was measured from the anterior most extremity of the fish to the end of the caudal fin. The total weight was measured in grams using Ohaus electric balance of 310g capacity.

Water Quality Monitoring

Water quality parameters of (temperature, DO, and p^H) were monitored weekly. Temperature was measured with mercury-in-glass thermometer calibrated in degree centigrade (°C), dissolved oxygen (DO) was determined using Winkler's method and p^H was determined using a p^H meter, to ensure they were within tolerable limits.

Survival and Mortality:

Survival and mortality of fish in each treatment were monitored by counting the mortalities on a daily basis.

Statistical Analysis:

The data collected was subjected to analysis using one-way analysis of variance (ANOVA) and Duncan's Multiple Range Test (DMRT) was used to compare the means.

RESULTS AND DISCUSSION

Measurements of weight and length were carried out weekly to determine increase in growth. The data obtained was also used to determine the following parameters MW, WG, SGR and K. These are presented in Table 1.

Maximum weight of 7.39±0.19g was recorded in Treatment 3 and a minimum of 5.35±0.31g was obtained in Treatment 1. In terms of SGR (%), Treatment 3 had the highest value of 1.19±0.02g and the lowest 1.01±0.03g was recorded in Treatment 1.Mean weight gain is presented in table 2. Treatment 3 favored higher weight gain of 9.09±2.68g.

Highest feed conversion ratio of 1.88±1.37 was also recorded in Treatment 3 while the minimum value of 8.34±2.12 was obtained in Treatment 1.

The least fish growth indices (WG and SGR) and highest FCR were recorded in Treatment 3, while highest values of growth indices and lowest FCR were obtained in Treatment 3; as such T3 gave the best performance in terms of growth and feed utilization.

Table 1: Growth parameters of the experimental fish (*Clarias gariepinus*) fed at varying frequencies.

Parameters	T1	T2	T3
IMW (g)	2.41±0.21	2.39±0.15	2.37±0.18
FMW (g)	$10.05±1.11^{d}$	$11.05±1.32^{b}$	$11.32±1.40^{a}$
WG (g)	$5.35±0.31^{d}$	$6.27±0.28^{c}$	$7.39±0.19^{a}$
SGR (%)	$1.01±0.03^{d}$	$1.10±0.05^{c}$	$1.19±0.02^{a}$
FCR	$8.34±2.12^{d}$	$5.65±1.19^{c}$	$1.88±1.37^{a}$
K	$0.59±0.09^{d}$	$0.73±0.03^{bc}$	$0.84±0.02^{a}$

Where: IMW = Initial Mean Weight, FMW = Final Mean Weight, MWG = Mean Weight Gain, WG = Weight Gain, SGR = Specific Growth Rate, FCR = Food Conversion Ratio, K = Condition Factor and SR = Survival Rate respectively

*Means in row with same letter are not significantly different (p>0.05)

Studies conducted on other fish species have shown that feed consumption and growth generally increased with feeding frequency up to a given limit, (Wang *et al*., 1998; Bascinar *et al*., 2007). This is in line with the findings in this study that feeding frequency had a significant effect on feed consumption and growth. T3 gave the best result in terms of feed conversion ratio (FCR) and other growth indices. This indicates that both growth and feed utilization were most efficient at this feeding frequency.

CONCLUSION

Increased feed digestibility and increased water quality are the benefits of using the correct feeding frequency. The result of this work is also in agreement with the findings of Ruohonen *et al*., (1998); that two or three times feeding a day is sufficient for maximum growth of a number of different fish species. This supports the hypothesis that more frequent feeding yields fish of more uniform sizes and this could arise because dominant individuals are less aggressive under such circumstances, or because more food is distributed to locations occupied by subordinates (Bascinar *et al*., 2007). The inter-individual size variation of fish in Treatment 3 was also lower than in the other Treatments. The study revealed that (T3) four times per day feeding frequency had the best growth performance for the culture of *Clarias gariepinus*.

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