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Growth of the Dutch Clarias (*Clarias gariepinus*) fingerlings fed two commercial feeds - Coppens and Skretting

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Abstract

The experiment was conducted to assess the performance of two commercial feeds on growth of the Dutch strain of African catfish *Clarias gariepinus* fingerlings for 56 days under hatchery condition in July and August, 2019 with the aim of comparing the growth response in terms of Specific Growth Rate (SGR), total weight, total length and survival rates. Sixty (60) fingerlings of *C. gariepinus* with average weight of 1.20 ± 0.00 g and two commercial feeds (Coppens and Skretting) with varying crude proteins were used for the study. Some water parameters analyzed indicated Temperature range of 27.35 ± 0.03 and 27.14 ± 0.07 for T1 and T2 respectively, pH of 7.41 ± 0.07 and 7.41 ± 0.03 , Total Dissolved Solid (TDS) of 65.38 ± 1.07 ppm and 73.75 ± 0.45 ppm, Electrical Conductivity (EC) of 130.75 ± 2.14 μS and 147.50 ± 0.90 μS and Dissolved Oxygen (DO) of 4.44 ± 0.04 mg/L and 4.51 ± 0.03 mg/L respectively. The treatments had no significant difference in terms of Mean Weight, Specific Growth Rate (SGR), Feed Conversion Ratio (FCR), Feed Conversion Efficiency and Survival Rate ($P < 0.05$). In terms of mean weight, Coppens gave 4.02g while Skretting gave 4.44g. SGR showed in Coppens 2.63 and 2.64 in Skretting. Although fish fed with Coppens and Skretting both demonstrated good growth performance.

Keywords: Fish feed, *Clarias gariepinus*, performance, Coppens, Skretting

1. Introduction

Culture of African catfish, *Clarias gariepinus* has received attention since the early 1970s but the industry remains relatively undeveloped largely due to dependence on aquatic products from capture fisheries. Currently, due to decline in most of the capture fisheries and increased demand for protein of aquatic products, the need for an alternative source, particularly from aquaculture is growing. One of the major obstacles confronting the development of aquaculture industry is availability of affordable and high-quality fish feed. Fish growth and survival rate depends on the kind of feed, feeding frequency, feed intake and the fish ability to absorb the nutrients. Substitution of commercial compounded diet for live feed is essential for lowering production cost while sustaining production of quality fishes. In this regard, efforts towards the search for alternatives to live feeds have been ongoing.

Fish nutritionists aim at producing a balanced commercial diet that promotes optimal fish growth and health. The quality of commercial feed should be determined for individual feeds to carefully monitor the feed consumption and growth rate of the fingerlings. Good quality feed and optimum feeding frequency may provide maximum utilization of diets and thus, fast growth of the fingerlings. However, poor quality fingerling feed lead to leaching of nutrients, reduction in feed conversion ratio and increase in input list, and also, accumulation of waste that adversely affect the water quality. Therefore, it is important to standardize the quality of commercial feed for the target species in aquaculture for optimum production. This experiment was designed to compare the growth response and survival rate of *Clarias gariepinus* fingerlings fed two commercial feeds using Coppens feed and Skretting feed.

2. Materials and Methods

2.1 Experimental setup

Fingerlings of the Dutch catfish (*Clarias gariepinus*) were purchased from Korex Fish Farms, Makurdi Benue State in the 1st week of July, 2019. A total of 60 fingerlings were collected. The fish were transported in jerry cans to the Department of Fisheries and Aquaculture hatchery. The fish samples were acclimatized in the hatchery condition for Seven (7) days in tanks of Fifty (50) litres volume each.

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2.2 Experimental procedure

The commercial feeds (Coppens and Skretting) were purchased from Jay brown Ventures Feed Shop at High Level Makurdi.

The fish were randomly stocked in triplicate, in 50 litres capacity tanks at 10 fish per tank. The tanks were arranged in a randomized block and were covered with nets. Water used was the Department of Fisheries Bore-hole water. Fish in each tank were of same size and were fed twice daily at 5% of their body shared between morning (7-8am) and evening (4-5pm). Feeding was done by scattering the feed into each tank using hand. Uneaten feed was removed from the water surface an hour after feeding using a hand net and faecal debris was siphoned from each tank daily. The water was changed weekly from the tanks and replaced with clean water from the hatchery. Length and weight of fish in each treatment and their respective replicates weighed using a metre rule and Metler weighing balance (model p168) respectively on weekly basis every (Friday). During weighing, fish were placed on a flat wooden surface and metric rule placed close to the fish to take readings of the length. The weight of the fish was measured by placing a plastic container containing little quantity of water on a digital weighing balance and the weight of the container zeroed, and then fish was added into the container and the readings were taken.

2.3 Determination of growth parameters

$$\text{Mean Initial Weight (MIW)} = \frac{\text{Total Initial Weight of fingerlings}}{\text{Total Number of Fingerlings}}$$

a. Mean Weight Gain (MWG) = Mean Final Weight - Mean Initial Weight

b. Growth Rate = $\frac{\text{Mean final weight} - \text{Mean Initial Weight} \times 100}{\text{Duration of the Experiment}}$

c. Specific Growth Rate (%/day) = $\frac{\ln \text{MFW} - \ln \text{MIW}}{\text{Time (days)}}$

Where "ln" = Natural logarithm

MFW = Mean Final Weight

MIW = Mean Initial Weight

d. Feed Conversion Ratio (FCR) = $\frac{\text{Weight of Feed Consumed}}{\text{Weight gain of fish}}$

e. Protein Efficiency Ratio (PER) = $\frac{\text{Mean weight Gain}}{\text{Weight of Protein fed}}$

Where protein fed = $\frac{\text{Crude protein} \times \text{weight of feed consumed}}{100}$

f. % survival rate = $\frac{\text{Number of fish survived}}{\text{Number of fish stocked}} \times 100$

g. feed conversion efficiency (FCE) = $\frac{\text{Final weight of fish}}{\text{Weight of feed given}} \times 100$

Percentage Index (PI) = $\frac{\text{Survival rate} \times \text{FMW} - \text{IMW}}{\text{Rearing duration (days)}}$

2.4 Water Quality Parameters

Water quality parameter of Temperature, Total Dissolved Solid, Electrical Conductivity, pH and Dissolved Oxygen were measured weekly with Combo Bi-Hanna Model SCL-08

and Portable Dissolved Oxygen Analyzer Model JPB-607. Water from the two (2) treatments were collected in separate containers and Combo Bi-Hanna was dipped into the water to test for content of Temperature, Total Dissolved Solid, Electrical Conductivity and pH, and the reading were taken. For Dissolved Oxygen, the Dissolved Oxygen Analyzer was also dipped into the water and readings were taken.

2.5 Statistical analysis

The means of water parameters were subjected to Analysis of Variance (ANOVA) while growth parameters were tested for significant difference using student t-test. All tests were carried out at 95% probability level.

3. Results

3.1 Growth performance of *Clarias gariepinus* fed Coppens and Skretting

The growth performance of *Clarias gariepinus* fingerlings fed (Coppens and Skretting feeds) gave mean weight increase of 5.22±0.01 in T1 and 5.75±0.06 in T2 after 8 weeks of culture, this shows a weight gain of 4.02±0.08g and 4.44±0.06g for T1 and T2 respectively. Specific Growth Rate (SGR) was 2.63±0.03 in T1 and 2.64±0.02 in T2, Feed Conversion Ratio (FCR) was 1.98±0.02 in T1 and 1.94±0.04 in T2. The mean value of Feed Conversion Efficiency was 50.42±0.46 in T1 and 51.56±1.09 in T2. The mean standard length increased to 11.30±0.06 (cm) and 12.20±0.06 (cm) for T1 and T2 respectively, the mean standard length increase was 7.33±0.13 (cm) and 8.90±0.00 (cm) for T1 and T2 respectively after 8 weeks of the experiment.

3.2 Weekly weight of *Clarias gariepinus* Fingerlings Fed Coppens and Skretting

The weekly weight of *Clarias gariepinus* fingerlings fed Coppens and Skretting indicates that weight increase was observed to be 5.75g in T2 and 5.22g in T1. The weight gain was 4.02g in T1 and 4.44g in T2. In week 1, the weight gains of T1 increased to 1.78g while T2 increased to 1.79g. In the second week, T1 increased to 2.14g and T2 2.20g. Week 3, T1 increased to 2.59g while T2 recorded 2.60g. In week 4, weight of T1 increased to 3.08g while T2 increased to 3.21g. In the fifth week, T1 and T2 increased to 3.55g and 3.96g respectively. Week 6 shows increase in weight in T1 and T2 as 3.86g and 4.42g respectively. In week 7, T1 increased to 4.61g while T2 increased to 5.14g. In the last week that is week 8, the weight of T1 increased to 5.22g while T2 increased to 5.75g. This result shows no significant difference in the weight gain between the two treatments (T1 and T2).

Table 1: Growth Performance of *Clarias gariepinus* fed Coppens and Skretting for 56 days

Treatments	Coppens	Skretting	P-value
MIW	1.20±0.00	1.31±0.01	0.000*
MFW	5.22±0.01	5.75±0.06	0.007*
MWG	4.02±0.08	4.44±0.06	9.915
MISL	3.97±0.09	3.30±0.06	0.003*
MFSL	11.30±0.06	12.20±0.06	0.000*
MSLG	7.33±0.13	8.90±0.00	0.000*
GR	0.072±0.00	0.079±0.00	0.022*
SGR	2.63±0.03	2.64±0.02	0.701
FCE	50.42±0.46	51.56±1.09	0.390
FCR	1.98±0.02	1.94±0.04	0.444
PER	0.089±0.00	0.101±0.00	0.008*
% Survival	66.67±6.67	76.67±3.33	0.251

Means with (*) varies significantly at 95% confidence level ($P < 0.05$)

Keys

MIW=Mean initial weight, MFW=mean final weight, MWG= Mean weight gain, MISL=Mean initial Standard length, MFSL=Mean final Standard length, MSLG=Mean Standard length gain GR=growth rate. SGR=specific growth rate, PER= protein efficiency ratio.

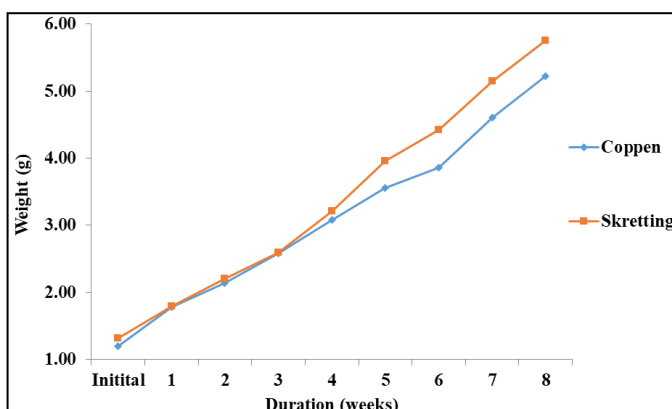


Fig 1: Weekly weight of *Clarias gariepinus* fingerlings fed Coppens and Skretting for 56 days.

3.3 Weekly standard length of *Clarias gariepinus* fingerlings fed Coppens and Skretting

The weekly standard length of *Clarias gariepinus* fingerlings fed Coppens and Skretting was observed to be highest in T1 than T2. The weekly standard length gains of T1 in the 1st to the last week (week 8) were as follows; (week1 = 5.17cm, week2 = 6.50cm, week3 =7.33cm, week4 =8.10cm, week5 =8.67cm, week6 =9.30cm, week7 =10.20cm, and week8 =11.30cm). While the weekly standard length of T2 within the 8 weeks of research were; week1 (5.00cm), week2 (6.27cm), week3 (7.37cm), week4 (8.50cm), week5 (9.30cm), week6 (10.20cm), week7 (10.88cm) and week8 (12.20cm). A significant difference was recorded in the standard length gain between the two treatments.

3.4 Water quality parameters assessed

The result of the water quality parameters assessed indicated that mean pH of the water in T1 was 7.41±0.07 and 7.4±0.03 for T2 at the end of the experiment (8 weeks) and no significant difference was recorded between the two treatments. The mean temperature of T1 and T2 was 27.35±0.03 °C and 27.14±0.07 °C respectively at the end of the experiment and this shows no significant difference between the temperatures of the treatments. The mean total dissolved solid (TDS) of T1 and T2 was 65.38±1.07ppm and 73.75±0.45ppm respectively, there was a significant difference observed in TDS between the water of T1 and T2. The mean electrical conductivity (EC) of T1 and T2 was 130.75±2.14µS and 147.50±0.90µS respectively. The result shows a significant difference in EC between the water of T1 and T2. For dissolved oxygen (DO), T1 and T1 recorded 4.44±0.04mg/L and 4.51±0.03mg/L respectively, and this result shows no significant difference between T1 and T2.

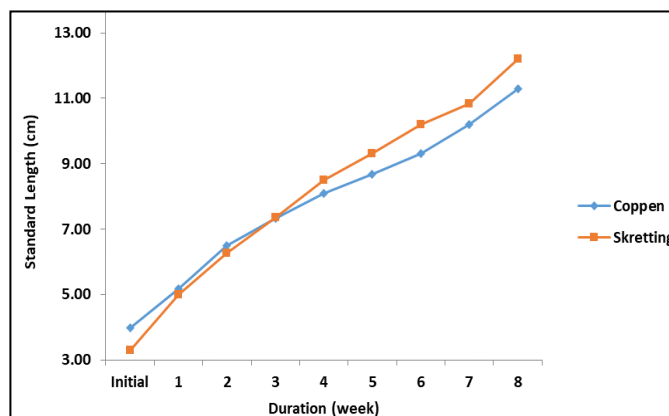


Fig 2: Weekly Standard Length of *Clarias gariepinus* fingerlings fed Coppens and Skretting for 56 days.

Table 2: Water quality parameters measured for 56 days.

Parameters	pH	Temp (°C)	TDS (ppm)	EC (µS)	DO (mg/L)
Coppens	7.41±0.07	27.35±0.03	65.38±1.07	130.75±2.14	4.44±0.04
Skretting	7.41±0.03	27.14±0.07	73.75±0.45	147.50±0.90	4.51±0.03
P-Value	0.907	0.014*	0.000*	0.000*	0.161

Means with (*) varies significantly at 95% confidence level (P< 0.05)

4. Discussion

The present study investigates the growth and survival of *Clarias gariepinus* fingerlings fed two commercial diets {Coppens and Skretting feed}. From the results, both diets recorded better performance values as reflected in the value obtained for FCR, SGR, PER, FCE and percentage survival (Table 1).

There was no significant difference (P<0.05) between FCR, SGR, FCE and survival rate of the two diets and this indicates that the fish was able to digest the diets and converts the diets into body tissues with same degree of efficiency. In the first two weeks of the experiment, their growth dropped drastically (Figure 1 and 2). It was probably due to the fact that the fishes were getting used to acclimatizing to the diets. Thereafter, all fishes picked up and started utilizing the diets better. The PER was significantly different between treatments. The survival rates for fish obtained in this study were consistent in both trials.

Agokei *et al.*, (2011) [1] reported a higher SGR value of 3.19^{d-1} using Coppens, Multifeed, Skretting, Eurogold, Vital and Ajanla feed, which may be due to feeding frequency and the type of feed. The high growth rate recorded in fingerlings fed both Coppens and Skretting may be attributed to the high nutritive value of the feeds and tolerable physico-chemical parameters, this is also in line with Dada and Gnanados, (1983) [4] who obtained high values for Coppens and Chivita feed. The growth of fish depends upon the ingredients and its percentage in the formulated feed (Glencross *et al.*, 2007) [5]. The results also compare well with comparative feed trials of Rahman *et al.*, (1997) [8] and Henken *et al.*, (1986) [7] who recorded best results for feed containing 40% and 58% CP respectively in *Clarias* spp. The results agree with that of Giri

et al., (2003)^[6] who reported an increase in body weight gain and SGR in post larvae of *Clarias hybrid* fed increased level of protein.

The water quality parameters showed little variation. The range of temperature, pH, Total dissolved solid, Electrical conductivity and Dissolved oxygen obtained is favourable for fish culture, they are within the range described as optimal by Boyd, (1979)^[3] and this agrees with similar work by Balogun *et al.*, (2004)^[2].

5. Conclusion

It can be inferred from these results that both Coppens and Skretting feed did better in growth performance and survival rate of *Clarias gariepinus* fingerlings.

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