

## Comparative Study of Growth Performance Feed Utilization of African Catfish (*Clarias gariepinus*) Fed on four different Commercial Feeds

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### **ABSTRACT:**

The efficiency of commercial fish feeds is a major determinant of growth performance and profitability in intensive aquaculture. This study compared the growth performance, feed utilization, and survival of African catfish (*Clarias gariepinus*) juveniles fed four commercial fish feeds. A total of 120 juveniles (mean initial weight  $12.5 \pm 0.3$  g) were stocked in twelve tanks using a completely randomized design with four dietary treatments and three replicates each. Fish were fed at 5% body weight per day for eight weeks. Growth parameters evaluated included weight gain, specific growth rate (SGR), feed conversion ratio (FCR), and survival rate. Significant differences ( $p < 0.05$ ) were observed among treatments. Feed B produced the highest weight gain, best FCR, and highest SGR, while Feed D recorded the lowest performance. Survival rates were high and did not differ significantly. The results confirm that commercial feeds vary considerably in nutritional efficiency, and appropriate feed selection is essential for optimal African catfish production.

**Keywords:** African catfish, commercial feeds, growth performance, feed utilization, aquaculture

### **INTRODUCTION:**

Aquaculture continues to play an increasingly important role in meeting global demand for animal protein, particularly in developing countries where capture fisheries are declining. In sub-Saharan Africa, African catfish (*Clarias gariepinus*) is among the most economically important cultured fish species due to its fast growth rate, efficient feed conversion, high survival under intensive culture conditions, and strong consumer preference. The intensification of African catfish farming has led to increased reliance on formulated feeds to support rapid growth and high stocking densities. Feed quality is widely recognized as the most important factor influencing growth performance, accounting for over 60% of total production costs in commercial aquaculture. Consequently, efficient feed utilization directly affects profitability, environmental sustainability, and resource use efficiency.

In response to growing demand, numerous commercial fish feeds are available in the aquaculture market. However, these feeds differ considerably in terms of crude protein content, lipid levels, ingredient composition, pellet stability, and processing technology. Such differences can result in significant variation in growth performance and feed utilization when fed to the same species under similar environmental conditions.

Despite widespread use of commercial feeds, many fish farmers lack access to independent scientific data comparing their biological performance. Previous studies have reported inconsistent growth responses of African catfish fed different commercial feeds, emphasizing the need for location-specific evaluation. This study therefore aimed to compare the growth performance, feed utilization efficiency, and survival rate of African catfish juveniles fed four commonly used commercial fish feeds under controlled conditions, and to relate the findings to previous research.

### **MATERIALS AND METHODS:**

#### **Experimental Site and System:**

The experiment was conducted in a controlled indoor aquaculture facility using twelve plastic tanks (capacity: 100 L). The tanks were supplied with dechlorinated freshwater and aerated continuously to maintain adequate dissolved oxygen levels throughout the study.

One hundred and twenty healthy African catfish juveniles (*Clarias gariepinus*) with a mean initial weight of  $12.5 \pm 0.3$  g were obtained from a commercial hatchery. Fish were acclimatized for two weeks during which they were fed a standard commercial diet and monitored for health status. Only active and healthy fish were used for the experiment.

**Experimental Design and Feeding Treatments:**

A completely randomized design (CRD) was employed, consisting of four dietary treatments designated as Feed A (Scretin), Feed B (Coppense), Feed C (Aquabel), and Feed D (Aloa Aqua). Each treatment was replicated three times with ten fish per tank.

Fish were fed the experimental diets at 5% of their body weight per day, divided into two equal meals administered at 08:00 and 16:00 h. Feeding rates were adjusted weekly based on biomass measurements to prevent underfeeding or feed wastage.

**Water Quality Management:**

Water quality parameters were monitored regularly throughout the experimental period. Temperature ranged between 26 and 28 °C, dissolved oxygen was maintained above 5 mg L<sup>-1</sup>, and pH ranged from 6.5 to 7.5. Partial water exchange (30%) was carried out every two days to maintain water quality and remove accumulated waste.

**Data Collection and Growth Indices:**

Fish were batch-weighed weekly using a digital balance after a 24-hour fasting period to minimize gut content bias. Growth and feed utilization parameters were calculated using standard equations:

- Weight gain (WG) = Final mean weight – Initial mean weight
- Specific growth rate (SGR, % day<sup>-1</sup>) = [(ln W<sub>2</sub> – ln W<sub>1</sub>) / t] × 100

- Feed conversion ratio (FCR) = Total feed intake / Total weight gain
- Survival rate (%) = (Number of fish harvested / Number stocked) × 100

**Statistical Analysis:**

All data were expressed as mean ± standard deviation. One-way analysis of variance (ANOVA) was used to test for significant differences among treatments, and mean separation was performed at p < 0.05.

**RESULTS:**

The mean growth performance of African catfish fed with four commercial feeds was tabulated in Table 1. In the result, significant differences (p < 0.05) were observed in final weight and weight gain among the treatments. Fish fed Feed B (Coppense) recorded the highest final mean weight (70.9 g) and weight gain (58.4 g), indicating superior growth performance. Feed A (Scretin) and Feed C (Aquabel) showed intermediate growth, while Feed D (Aloa Aqua) resulted in significantly lower growth. The superior growth observed in fish fed Feed B suggests better nutrient availability and digestibility, likely due to higher-quality protein sources or improved pellet stability. The poor growth recorded for Feed D indicates suboptimal nutritional composition, which may limit protein utilization and energy availability for growth. Values with different superscripts differ significantly (p < 0.05).

**Table 1: Mean growth performance of African catfish fed four commercial feeds**

| Parameter          | Feed A                  | Feed B                  | Feed C                  | Feed D                  |
|--------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Initial weight (g) | 12.5 ± 0.3              | 12.6 ± 0.4              | 12.4 ± 0.3              | 12.5 ± 0.2              |
| Final weight (g)   | 64.2 ± 2.1              | 70.9 ± 2.4              | 61.5 ± 1.9              | 55.3 ± 1.7              |
| Weight gain (g)    | 51.7 ± 1.8 <sup>b</sup> | 58.4 ± 2.0 <sup>a</sup> | 49.1 ± 1.6 <sup>b</sup> | 42.8 ± 1.5 <sup>c</sup> |

Feed utilization indices differed significantly among treatments (Table 2). Feed B produced the highest SGR (3.12% day<sup>-1</sup>) and the lowest FCR (1.32), indicating efficient conversion of feed into biomass. Conversely, Feed D recorded the lowest SGR and highest FCR. Lower FCR values indicate better feed efficiency. The superior feed utilization observed with Feed B implies effective digestion and absorption of nutrients. The poor FCR of Feed D suggests feed wastage, reduced palatability, or lower digestibility, which may contribute to increased production costs.

**Table 2: Feed utilization indices of African catfish fed different commercial feeds**

| Parameter                  | Feed A                   | Feed B                   | Feed C                   | Feed D                   |
|----------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| SGR (% day <sup>-1</sup> ) | 2.89 ± 0.06 <sup>b</sup> | 3.12 ± 0.08 <sup>a</sup> | 2.81 ± 0.05 <sup>b</sup> | 2.56 ± 0.04 <sup>c</sup> |
| FCR                        | 1.45 ± 0.04 <sup>b</sup> | 1.32 ± 0.03 <sup>a</sup> | 1.53 ± 0.05 <sup>b</sup> | 1.71 ± 0.06 <sup>c</sup> |

Table 3 revealed the high and comparable survival rates across all treatments indicate that none of the feeds had adverse effects on fish health. This also suggests that environmental conditions were favorable and that growth differences were

primarily due to feed quality rather than mortality. Survival rate was high across all treatments and showed no significant difference ( $p > 0.05$ ).

**Table 3: Survival rate of African catfish fed four commercial feeds**

| Feed   | Survival (%) |
|--------|--------------|
| Feed A | 96.7 ± 1.2   |
| Feed B | 98.3 ± 0.8   |
| Feed C | 95.0 ± 1.5   |
| Feed D | 96.7 ± 1.0   |

**DISCUSSION:**

The results of this study clearly demonstrate that the growth performance and feed utilization of African catfish juveniles are significantly influenced by the type of commercial feed administered. The observed variations in weight gain, specific growth rate (SGR), and feed conversion ratio (FCR) among the treatments indicate differences in the nutritional quality, digestibility, and efficiency of the commercial feeds evaluated.

The superior growth performance observed in fish fed Feed B, as reflected by the highest final weight and weight gain, suggests that this feed provided a more balanced nutrient profile suitable for juvenile *Clarias gariepinus*. Protein quality and amino acid balance are critical factors influencing growth in catfish, particularly during the juvenile stage when protein demand is high. This finding is consistent with the reports of NRC (2011) and Adewolu *et al* (2008), who emphasized that diets containing high-quality protein sources and adequate energy promote faster growth and improved feed efficiency in African catfish.

The significant differences in specific growth rate observed among treatments further confirm the influence of feed quality on metabolic efficiency. The SGR values obtained in this study (2.56–3.12% day<sup>-1</sup>) fall within the range reported by Fagbenro and Adebayo (2005) and Olurin *et al* (2012) for juvenile African catfish fed commercial diets. The higher SGR recorded for Feed B agrees with the findings of Adeparusi *et al* (2010), who reported enhanced growth rates in catfish fed nutritionally superior diets with better digestibility. In contrast, the lower SGR recorded for Feed D suggests inadequate nutrient availability, which may have limited protein synthesis and somatic growth.

Feed conversion ratio is one of the most important indicators of feed utilization efficiency in aquaculture. The significantly lower FCR observed in fish fed Feed B indicates more efficient conversion of feed into body mass. Similar FCR values have been reported by Ayinla *et al* (2018) and Eyo and Ekanem (2011) in comparative studies of commercial fish feeds. Lower FCR values are economically desirable, as they reduce feed cost per unit

weight gain. Conversely, the higher FCR recorded for Feed D suggests poor feed utilization, possibly due to inferior ingredient quality, reduced palatability, or poor pellet stability, leading to feed wastage. This observation supports the findings of Jimoh *et al* (2014), who reported that poorly processed commercial feeds often result in high FCR and reduced growth performance.

The relatively uniform and high survival rates recorded across all treatments indicate that none of the commercial feeds had deleterious effects on fish health. Survival rates exceeding 95% are typical for African catfish under controlled culture conditions and reflect the hardiness of the species. Similar survival rates have been reported by Ayinla and Nwadukwe (2003) and Adewumi and Olaleye (2011), who noted that African catfish can tolerate a wide range of dietary formulations provided basic nutritional requirements are met. The absence of significant differences in survival among treatments suggests that growth differences were primarily attributable to feed quality rather than environmental stress or feed toxicity.

The findings of this study are also consistent with reports by Sogbesan and Ugwumba (2008) and Ogunji *et al* (2007), who emphasized that variations in growth performance among commercial feeds are often linked to differences in raw material sourcing and processing techniques. High-quality extrusion and proper heat treatment improve nutrient digestibility and pellet water stability, which enhance feed utilization. Feeds with inferior processing quality tend to disintegrate rapidly in water, increasing nutrient leaching and reducing intake efficiency.

Although this study demonstrated clear differences in biological performance among the feeds, it did not assess the proximate composition or economic cost of the diets. Previous studies by Fagbenro *et al* (2010) and Gabriel *et al* (2007) have shown that feeds with superior growth performance may not always be the most cost-effective. Therefore, while Feed B showed the best biological performance, further evaluation incorporating economic analysis would provide a more comprehensive basis for feed recommendation.

Overall, the results of this study agree with most previous studies that commercial fish feeds vary significantly in

their ability to support optimal growth and feed efficiency in African catfish. Minor deviations from some reported findings may be attributed to differences in fish size, culture system, feeding rate, and environmental conditions.

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