

## GROWTH PERFORMANCE OF CLARIID CATFISH AND THEIR HYBRID FED WITH COMMERCIAL AND FORMULATED FEED FROM LOCALLY AVAILABLE AGRICULTURAL BY-PRODUCTS

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### ABSTRACT

This study investigated the growth performance of three Clariid catfish species *Clarias gariepinus*, *Heterobranchus longifilis*, and their hybrid, *heteroclarias* fed with commercial and compounded feeds. The research aimed to determine the efficiency of a formulated least-cost feed compared to commercial feed in promoting fish growth. The study was conducted at the Fish Farm of Prince Abubakar Audu University, Nigeria, using an experimental setup involving 18 hapas. Growth performance metrics such as mean weight gain, specific growth rate, and feed conversion ratio were calculated for the species over the trial period. Results indicated that the hybrid *Heteroclarias* exhibited the highest growth rates and feed utilization, followed by *Clarias gariepinus* and *Heterobranchus longifilis*. Fish fed with the compounded feed performed slightly better than those on commercial feed. This finding suggests that locally formulated diets from agricultural by-products could offer a cost-effective alternative to commercial feeds for sustainable aquaculture in Nigeria. The study highlights the potential of compounded feed to enhance growth performance and support food security in aquaculture.

**Keywords:** Fish, Hybrids, Feeds, Performance, Food security

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### INTRODUCTION

Fish is an important component of human nutrition and a principal source of animal protein for sixty percent of the world's population especially in developing countries (FAO, 2008). In recent years, fish has been classified as a functional food which helps in the prevention and management of heart disorders (Ameigheme, 2015). The health and nutritional status of young children, pregnant and lactating women is enhanced through consumption of fish because it provides high value protein and polyunsaturated omega-3-fatty acids (FAO, 2008). As global population continues to grow, there is an increased demand for fish and other aquatic products. Consumption of fish and other aquatic products globally is predicted to reach 186 million tonnes by the year 2030 (FAO, 2014). World fish production was estimated to be 158 million tonnes in 2012 and 42.2 % of this is from aquaculture which is expected to cushion the effect of increased demand for fish products and production from capture fisheries which is at decline (FAO, 2014).

The Clariids constitute an excellent food fish of high commercial value. In fact, the catfish species are very important to the sustainability of aquaculture industry in Nigeria (Owodeinde and Ndimele, 2011).

Catfishes of the genera *Clarias* and *Heterobranchus* are important aquaculture candidates in Africa and Nigeria (Ayinla, 2007; Nwafili and Gao, 2007). These species have great potential to contribute to fish production and are readily acceptable to fish farmers. *Heterobranchus longifilis* is highly priced and has one of the fastest growth rates among the African catfishes (Legendre et al., 2023). It grows to a very large size, commands high market value due to its taste and flavor. *Heterobranchus longifilis* is an omnivore and has the ability to use supplementary feed effectively. The Nigerian farmer has not been able to meet the demand for *H. longifilis* due to high cost of feeding hence there is the need to boost the production of this species for food sustainability and food security using least cost feeds.

In the present study, a least cost fish feed was formulated and compared with a commercial feed in terms of food conversion efficiency and growth performance.

### MATERIALS AND METHODS

#### Study area

The study was conducted at the Department of Fisheries and Aquaculture Fish Farm of the Prince Abubakar Audu University Anyigba in the Guinea Savannah Zone of Nigeria at latitude 7°28'51" N and longitude 7°11'14" E, at an altitude of 420m above sea level.

### Proximate Analysis

The proximate composition of the raw and processed Roselle seed meals was analyzed. The dry matter or moisture content, Ash content, crude protein, crude lipid, crude fibre, Nitrogen free extracts and total carbohydrates were determined by AOAC (1990) method.

### Experimental design and setup

The experiment was designed as 3x2 factorial experiment laid in randomized complete block design (RCBD), in which the three species constitute a factor and two feed types are another factor. A total of 18 hapas in a pond with dimension 3m x 5m x 1.5m which were carefully tied to bamboo sticks laid on a concrete pond were used. Water was supplied from the bore hole through inlet pipe.

### Growth Parameters measured

The following growth parameters were calculated as described by Castell and Tiews (1980):

$$\text{Mean Weight Gain (MWG)} = W_2 - W_1 \text{ (g)} \quad (1)$$

Where  $W_2$  = Final mean weight (g);  $W_1$  = Initial mean weight (g)

$$\text{Specific Growth Rate (SGR)} = \frac{\ln W_2 - \ln W_1}{T_2 - T_1} \times 100 \quad (2)$$

Where  $W_2$  = Final weight;  $W_1$  = Initial weight;  $T_2 - T_1$  = Time interval between  $W_2$  and  $W_1$  in days;  
 $\ln$  = Natural log

$$\text{Food Conversion Ratio (FCR)} = \frac{\text{Total Feed consumed (g)}}{\text{Weight gain by fish (g)}} \quad (3)$$

$$\text{Survival Rate (SR)} = \frac{\text{Total number of fishes harvested} \times 100}{\text{Initial number of fish stocked}} \quad (4)$$

$$\text{Protein Efficiency Ratio (PER)} = \frac{\text{Weight gain by fish (g)}}{\text{Protein intake by fish (g)}} \quad (5)$$

$$\text{Where protein intake} = \frac{\text{Total feed consumed} \times 100}{\text{Crude protein in feed}} \quad (6)$$

$$\text{Apparent Net Protein Utilization (ANPU)} = \frac{\text{Fish protein gain} \times 100}{\text{Protein consumed}} \quad (7)$$

Where:

$$\text{Fish protein gain} = \text{final body protein} - \text{initial body protein} \quad (8)$$

## RESULTS

### Growth Performance of Three Clariid Catfish Fed with Commercial and Compounded Feeds

Results of the growth performance of the three Clariid catfish *C. gariepinus*, *H. longifilis* and *Heteroclaris* are shown in Table 1. The initial weights of the experimental fish *C. gariepinus*, *H. longifilis* and *Heteroclaris* at the beginning of the experiment were 16.00, 16.00 and 16.33, respectively. At the end of the experiment, the final weights recorded increased to 43.55, 52.05 and 39.04 respectively. The weight gained after the experimental period for each of the species was 27.55, 36.05 and 22.71 respectively. The daily weight gain for each species was recorded at 0.49, 0.64 and 0.40 respectively. The specific growth rate the species were 0.77, 0.91 and 0.68 respectively.

As shown in Table 1, the initial weight of the commercial feed at the beginning of the feeding trial was 16.66 and rose to 46.11 at the end of the feeding trial period as the final weight. The weight of the commercial feed gained was 29.44 while the daily weight gain for the commercial feed was 0.52. The specific growth rate of the commercial feed was 0.78. The initial weight of the formulated feed at the start of the feeding trial was 15.55, the final weight at the end of the feed trial increased to 43.65. The weight gained over the trial period was 28.10 while the daily weight gain was 0.50. The daily weight gain of the formulated feed during the feed trial was recorded at 0.79.

**Table 1: Growth Performance of Three Clarid Catfish Fed with Commercial and Compounded Feeds**

Species	Parameters				
	Initial weight	Final weight	Weight gain	Daily gain	SGR
Clarias	16.00	43.55 <sup>b</sup>	27.55 <sup>b</sup>	0.49 <sup>b</sup>	0.77 <sup>b</sup>
Heteroclarias	16.00	52.05 <sup>a</sup>	36.05 <sup>a</sup>	0.64 <sup>a</sup>	0.91 <sup>a</sup>
Heterobranchus	16.33	39.04 <sup>c</sup>	22.71 <sup>c</sup>	0.40 <sup>c</sup>	0.68 <sup>c</sup>
<b>SEM</b>	<b>0.68</b>	<b>1.00</b>	<b>1.13</b>	<b>0.02</b>	<b>0.03</b>
<b>Diets</b>					
Commercial	16.66	46.11	29.44	0.52	0.78
Compounded	15.55	43.65	28.10	0.50	0.79
<b>SEM</b>	<b>0.70</b>	<b>4.12</b>	<b>4.33</b>		<b>0.07</b>

Mean values along the columns with similar superscript did not differ significantly ( $P>0.05$ ) from each other  
SEM standard error of mean; SGR = Specific growth rate

## DISCUSSION

The results of the growth and nutrient utilization parameters of the experimental fish; *Clarias gariepinus*, *Heterobranchus longifilis* and their hybrid; Heteroclarias fed on commercial and formulated diets revealed that the fish were able to utilize the diet effectively under the culture medium. This is evident from the fact that throughout the experimental period there was no record of any disease or any disorder as a result of nutritional deficiencies. This is in accordance with the report of Khan et al. (1989), Shepard and Bromage (1988), Faturoti et al. (1986) who found that a well-balanced diet containing the essential nutrients only resulted in suitable proportion and not in higher production: It also provided the means to promote recovery from disease or help the fish in overcoming the effects of environmental stress. Growth was expressed by mean weight gain (WTG), Daily rate of growth (DRG), Specific growth rate (SGR) and nutrients utilization efficiency was expressed by food conversion ratio. The hybrid (Heteroclarias) had the highest growth rates and feed utilization 52.05 in all feed treatments, followed by *Clarias gariepinus* 43.55 and lastly by *Heterobranchus longifilis* 39.04. This result is in line with the work of Jensen et al. (1983), Bakos (1987), Madu et al. (1991, 1992), Salami and Fagbenro (1993) who observed that hybrids in most cases were superior to their parental line in terms of growth, food conversion and disease resistance. This shows that locally formulated diets from agricultural by-products can have the same if not more effects or end results in fishes after the culture period as do commercial diets.

## CONCLUSION

The fish species fed the formulated diet did well and slightly better than those fed with the commercial diet. Of all the species examined, Heteroclarias, a hybrid of *C. gariepinus* and *H. longifilis* had better growth performance and nutrient utilization compared to others.

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