

IMPACT ASSESSMENT OF ROTIFER AND COPPENS ON THE DEVELOPMENT OF AFRICAN CATFISH (*Clarias gariepinus*) LARVAE

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Abstract: The African catfish (*Clarias gariepinus*) is the most widely cultivated fish species in Nigeria due to its fast growth rate, high fecundity, disease resistance, and adaptability to artificial feed. However, Nigerian fish farmers face significant challenges, particularly the high cost and limited availability of quality feed, which accounts for approximately 60% of production costs. This study compared the suitability of live rotifers (*Brachionus* spp.) and Coppens, a commercial fish feed, for feeding *C. gariepinus* larvae. The experiment was conducted at the Fisheries Hatchery Unit, Kebbi State University of Science and Technology, using a completely randomized design (CRD) with six replicates. Growth performance indicators such as weight gain, length gain, specific growth rate (SGR), feed conversion ratio (FCR), and survival rate were evaluated. The results showed that *C. gariepinus* fed Coppens exhibited significantly higher growth performance ($P < 0.05$) than those fed live rotifers, with superior weight gain (0.80 ± 0.28 g vs. 0.66 ± 0.26 g), length gain (3.04 ± 0.34 cm vs. 2.76 ± 0.33 cm), and SGR ($2.91 \pm 0.16\%$ vs. $1.28 \pm 0.90\%$). Conversely, fish fed rotifers showed a higher survival rate ($68.70 \pm 3.69\%$) compared to those fed Coppens ($53.00 \pm 7.00\%$). The findings indicate that while Coppens is more effective for growth, live rotifers can serve as a supplementary feed. It is recommended that rotifers can be further processed into rotifer meal to enhance their nutritional value and reduce dependence on expensive imported fishmeal.

Keywords: AFRICAN CATFISH, *Clarias gariepinus*, ROTIFERS, COPPENS, LARVAE.

INTRODUCTION

The African catfish (*Clarias gariepinus*) is the most widely grown species in Nigeria because of its high market value, high stocking densities under culture conditions, fast growth rate, disease resistance, and acceptability of artificial feed, high fecundity, good taste and meat quality, ease of artificial breeding Ellender et al. (2014). Although the Nigerian government and other Non-Governmental Organizations (NGOs) have raised awareness of the importance of fish culture, most Nigerian farmers continue to face significant obstacles that impede the success of their production, despite the fact that the culture of *C. gariepinus* tends to grow in Nigeria. According to Jamu and Ayinla (1988), the absence of high-quality feed, which makes up at least 60% of the entire cost of fish production, is impeding the growth of aquaculture in Nigeria (Benjamin et al., 2021).

Since the 1970s, rotifers, primarily of the genus *Brachionus*, have been used as live food organisms in aquaculture (Lubzens et al., 2001). They are the most popular live food because they are the right size for the majority of marine fish larvae, can be cultivated at high densities, have a high rate of reproduction (because they can reproduce parthenogenetically depending on the environment), can withstand high temperatures and salinities, swim slowly, and are filter feeders (Lavens and Sorgeloos, 1996).

Research over the years has shown that the use of zooplankton in larviculture has tremendously increased the survival and growth of fish fry (Ovie, et al., 2003). As such successful culturing of most fish larvae, juvenile and fingerlings requires the presence of zooplanktons mainly rotifers as fish food (Arimoro and Ofojekwu, 2003).

Nigerian farmers are now dependent on imported foreign feed, such as Aqua Aller, Coppens, Skrettings, Multifeeds, Podder feeds, etc., due to the current shortage of high-quality feed in the country. The cost, irregularity, and supply volatility of these imported foreign feeds are among their drawbacks, particularly in rural areas where the majority of fish farms are situated. However, due to its high protein content, balanced amino acid profile, excellent digestibility and palatability, and abundance in vital n-3 polyenoic fatty acids, fish meal is the most sought-after animal protein element in aqua feed used by commercial feed production enterprises Eyo and Ekanem (2011).

This research was carried out to identify the suitable feed for *C. gariepinus* at the larvae stage between the rotifers (natural feed) and coppens (commercial feed).

METHODOLOGY**3.1 Description of the Study Area**

This research was conducted in the fisheries hatchery unit of Department of Forestry and Fisheries, Kebbi State University of Science and Technology Aliero, in Aliero Local Government, Kebbi State Nigeria. The University lies on latitude 12°16'42"N and longitude 4°27'6"E of the equator. The annual temperature varies considerably but usually ranges between 26°C to 38°C. There are two distinct season in the regime rainy season which started usually around May and last till around September and dry season from October to April. The annual rainfall is frequently erratic and varies distributed from 500mm to 1300mm per annum (Smanr, 1998).

3.2 Sample Collection

A total of 90 larvae of *Clarias gariepinus* were obtained from the fish hatchery unit of Department of Forestry and Fisheries, KSUSTA. Zooplanktons were cultured in the earthen pond (60liters) from Department of Forestry and Fisheries, KSUSTA. While coppers was purchased from Birnin kebbi.

3.3 Experimental Design

Six (6) 25 liters plastic bowl were used for this study which comprises of two treatments with six replicates. In the complete randomized design (CRD) at rate of 15 larvae per each bowl. The fish were weight with electronic sensitive weighing balance (EHA 251 Model).

3.4 Determination of Proximate Composition of the Feed

Proximate composition of both coppers and rotifers was obtained from previous literature.

3.5 Sampling

The random sampling of five (5) fish at different location in the plastic bowl (25liter) to measure the length and weight of the fish to determine the growth performance of the fish cultured with natural (rotifers) and commercial (coppers).

3.6 Experimental Feeding

The treatment one with three replicate were fed with coppers at 0.3mm to 0.5mm of 5% their body weight. Treatment two with three replicate were fed with rotifer according to their body weight.

3.7. Procedure of the production of zooplankton

The measurements of the earthen pond is 10meter×5.6meter×0.80meter size and the volume of 381.08 were used and also the manure of 20kg was obtain from labana farm Aliero and also 1litre of water were sample to determine the presence of the Zooplankton and to know the quantity of manure to be added.

3.8 Materials use in the production of zooplankton

Scoop net, plastic bucket, mesh size 50 micro and mesh size 500 micro

3.9 Measurement of Water Quality Parameters

Water quality parameters measured include, dissolved oxygen, pH and temperature.

Estimation of Growth Performance

The growth performance of the *clarias gareipinus* larvae was determined as follows.

Weight gain

Weight gain was calculated using the formulae:

Weight gain = final weight – initial weight.

Length gain

Length gain = L2 - L1 where L1 and L2 are the initial and final fish length (cm) respectively

Survival rate

Survival rate (%) = number of fish that survived / total number of fish stocked X 100

Feed Conversion Ratio

$$FCR = \frac{\text{Total Feed Intake (kg)}}{\text{Total Weighth Gain (kg)}}$$

Specific growth rate

Specific growth rate was calculated from the following relationship (Brown, 1957) as cited by Adukwu (2004) as;

$$SGR = \frac{\ln W_2 - \ln W_1 \times 100}{Y_2 - Y_1}$$

Where ln = natural logarithm

W2 and W1 = final and initial weights in grams and

Y1 and Y2 = end of growth period and beginning of some

3.17 Data Analysis

Survival, growth responses and feed utilization obtained from the different treatment and their replicate were subjected to data 1 analysis. Data collected was used Least significant difference (LSD) ($P > 0.05$) and Data were subjected to analysis of variance (ANOVA).

RESULTS AND DISCUSSION

Results

Table 4.1: Proximate composition of coppens and rotifers feed.

PROXIMATE COMPOSITION	TREATMENT (A)	TREATMENT (B)
Moisture (%)	09.10	12.47
Crude protein (%)	40.00	42.00
Ether extract (%)	12.00	10.50
Ash (%)	09.50	07.40
Crude Fiber (%)	04.00	05.48
Nitrogen free extract (%)	25.40	22.15
TOTAL	100	100

Table 4.2; Water quality parameters of experimental feeding.

PARAMETERS	TREATMENT (A)				TREATMENT (B)			
	W1	W2	W3	W4	W1	W2	W3	W4
Temperature (°C)	27	26	27	27	26	26	27	27
Ph	7.6	7.5	7.7	7.6	7.5	7.6	7.7	7.6
Dissolve oxygen(mg/L)	6.4	6.3	6.4	6.4	6.3	6.4	6.3	6.2

Table 4.3: Survival and growth parameters of *Clarias gariepinus* larvae fed with coppens and rotifers, feeding for 30 day.

PARAMETERS	TREATMENTS (A)	TREATMENTS (B)
Weight gain (g)	0.80±0.28 ^a	0.66±0.26 ^b
Length gain (cm)	3.04±0.34 ^a	2.76±0.33 ^b
Specific growth rate	2.91±0.16 ^a	1.28±0.90 ^b
Feed conversion ratio	0.97±0.49 ^b	1.44±0.12 ^a
Survival rate (%)	53.00±70 ^b	68.70±3.69 ^a

Mean (± SE) values followed by the same superscript within the rows are not significantly different at (p > 0.05)

Discussion

In aquaculture, feed typically accounts for 50-80% of the total production costs, which is a significant determinant of the farmer's profit margin (Tacon&Metian, 2008; Tana, et al., 2008). According to Oso et al., (2011). Aquaculture is supported by development of new species-specific diet formulations especially, as it expands to satisfy increasing demand for affordable, safe and highquality fish and sea food products. Results obtained from this study clearly indicate that *C. gariepinus* fed Coppens feed performed better than *C. gariepinus* fed live rotifers in terms of growth which was evaluated using weight gain, Length gain, and specific growth rate. Weight gain of 0.80 ± 0.2g obtained for *C. gariepinus* fed Coppens feed was significantly higher (P<0.05) from *C. gariepinus* fed live rotifers. Length gain of 3.0 ± 0.34cm obtained for *C. gariepinus* fed Coppens feed was also significantly higher (P<0.05) than 2.76 ± 0.33 obtained for *C. gariepinus* fed live rotifers.

Fish like other animals, has a requirement for essential nutrients for growth and reproduction repairs. Findings obtained in this study showed that live rotifers used in this study did not provide all the essential nutrients required by *C. gariepinus* for optimal growth as evident in the fish growth. Although proximate analysis of rotifers showed that rotifers contains crude protein (42.%), ash (7%), lipid (10%), moisture (12.4 %) and fibre (5.4%), fish fed live rotifers did not favorably compete with fish fed Coppens feed. This indicates that for fish to grow optimally, they must be fed with balanced diet containing all the required nutrients in the correct proportion. According to Eyo and Ekanem (2011), nutrients must be able to be digested and absorbed in a form that makes them available for providing energy and substrate for growth (bioavailability). Results obtained in this study are similar to Ekanem et al., (2012) and Eyo et al., (2013). Who reported that Coppens feed met the nutritional requirements of *C. gariepinus* in a culture system. Growth rate and specific growth rate, was significant (P<0.05) better in fish fed with Coppens feed than feed fed live rotifers. This findings indicates that growth rate and specific growth rate of *C. gariepinus* influenced by feed. This observation is similar to Ekanem et al., (2012) and Ekanem et al., (2013). Who reported a better growth rate and specific growth rate; in *C. gariepinus* fed Coppens feed. Results obtained for fish fed live rotifer in this study shows that live rotifers can only be used as a supplementary food and not a complete ration for fish.

According to Ekanem et al., (2013), the amount of feed consumed is a crucial factor for calculating food conversion ratio (FCR) in fish nutritional studies. Eyo et al., (2014) reported that FCR is often used to evaluate the efficiency of a particular diet and as explained by De Silva and Anderson (1995). A good feed will give a lower FCR value. Results of this study showed that FCR will be significantly (P<0.05) in fish fed Coppens feed (0.97 ± 0.49) than fish fed live rotifers (1.44± 0.12) even though food consumed will be significantly higher in fish fed Coppens feed (1.211. ± 0.822g) than fish fed live rotifer (1.032± 0.74g). Ekanem et al., (2013) and Eyo et al., (2014) to be optimal for *C. gariepinus* growth. Although percentage survival was insignificantly higher (P>0.05) in fish fed rotifers feed (68.7± 3.695) than fish fed coppens (53 ± 7.1), it was not affected by either the live rotifer or Coppens feed used in this study. Water quality parameters including water temperature, pH and dissolved oxygen was within the acceptable range for optimal fish growth and health as recommended by Boyd (1979) and Viveen et al., (1986).

5.2 CONCLUSION

Findings of this study has demonstrated that *C. gariepinus* fed Coppens feed performed better than *C. gariepinus* fed live rotifers as evident in the growth indices and food utilization indices values which could be attributed to the nutritional quality of Coppens feed. Fish survival was not found to be affected by live rotifers or Coppens feed used in

this study. Although live rotifer is rich in protein and other proximate indices, it is incapable of providing *C. gariepinus* with all the nutrients required for optimal growth.

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