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Growth Response and Survival of *Clarias gariepinus* Fry Fed Different Starter Diets

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Abstract

An experiment was conducted to determine the effect of different starter diets (Artemia, Skretting fry feed and a combination of Artemia and Skretting starter diet) on growth performance and survival of African catfish fry. The experiment was carried out at the hatchery section of Happy Island Garden, Sokoto in a completely randomized design. A total of 450 four-day-old fry were stocked in nine plastic bowls of 30 litre capacity at a stocking density of 50 fish per bowl. The result showed that in terms of Final Mean Weight, Weight Gain, Percentage Weight Gain and Specific Growth Rate of the fry, there was significant difference ($p<0.05$) between fry fed solely on Artemia (treatment A) with mean values of 0.07, 0.07, 2455.55 and 23.13 respectively and fry fed solely on Skretting (Treatment B) which has mean values of 0.06, 0.05, 1900.00 and 21.33 but no significant difference ($p>0.05$) exist between fry in Treatment A and fry in Treatment C. Survival rate was also highest in treatment A with a mean value of 73.33 which differs significantly ($p<0.05$) from treatment B and treatment C with mean values of 46.67 and 50.00 respectively. It can be concluded from this study that *C. gariepinus* fry fed on Artemia only (Treatment A) has the best growth performance and survival which shows why Artemia has been the most used larval rearing diet on African catfish and this experiment also demonstrated that Artemia can be used to feed *C. gariepinus* fry for more than one week.

Keywords

African Catfish, *Clarias gariepinus*, Catfish Fry, Artemia, Skretting

1. Introduction

The African Catfish is widely considered as the leading cultured fish in Nigeria. Some of the credentials of African catfish are: high growth rate reaching market size of 1 kg in 5–6 months under intensive management conditions: highly adaptable and resistant to handling and stress; can be artificially propagated by induced spawning techniques for reliable mass supply of fingerlings; commands a very high commercial value where it is highly cherished as food in Nigerian homes and hotels [1]. According to Oladosu *et al.* [2] African catfish (*Clarias*) is the most sought after fish species among fish farmers and consumers because it commands a very good commercial value in Nigerian markets.

The success of fish farming enterprises is premised by the availability of good quality fish seeds. This is because as the marketable adults are sold out from the farm, young ones are provided to replenish the stock for the sustenance of the business.

According to Benedict *et al.* [3] *Clarias anguillaris* and *Clarias gariepinus* are the two species most readily acceptable in Nigeria, because they grow to large sizes. African catfish hardly reproduces in captivity but with the popular induced breeding technique (artificial method of spawning, incubation and hatching of eggs under controlled environmental conditions), it has been made possible to produce fish seed all year round [4].

Clarias fish is widely cultured in Nigeria. It is acceptable among consumers and has high economic value. However, the issue at stake is how to ensure high fry survival. After 3–4 days, when about two-thirds of the yolk sac has been absorbed,

the larvae (about 2–3 mg) begin to swim vigorously in a fish-like manner searching for exogenous food items, failure of which the larvae weaken beyond recovery. This stimulates cannibalism and high hatchery losses. Success of larval rearing depends mainly on the availability of suitable diets that are readily consumed, efficiently digested and provides the required nutrients to support good growth and health [5]. According to Mwanja, *et al.* [6, 7] 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 depend on the kind of feed, feeding frequency, feed intake and the fish's ability to absorb the nutrients. Starter feeds are important in the growth of African catfish larvae. Presently there are several types of starter feeds, manufactured by different brands, for rearing of fish fry and several researches showed that live feeds such as *Artemia*, rotifers, copepods, *cladocerans* have been employed with successful outcomes in feeding most fry of *C. gariepinus* [7-9].

According to Egwenomhe, *et al.* [10] no perfectly suitable larval diet has yet been developed, especially to meet our demand in Nigeria. The present work therefore is focused to compare the effect of different starter diet on *C. gariepinus* fry.

2. Methodology

2.1. Experimental Diets and Treatments

This study was conducted at the Fish Hatchery section of Happy Island Garden, Sokoto, Nigeria, for 14 days. *Clarias gariepinus* larvae were obtained through artificial induced breeding technique. Four days after hatching, when yolk sac must have been absorbed, 450 healthy larvae were randomly selected and distributed into nine plastic bowls with a capacity of holding 30 L of water at a density of 50 larvae per tank.

Three (3) experimental diets were used and assigned into treatments for the experiment. They are; Treatment A (Artemia only), Treatment B (Skretting fry feed only) and Treatment C (a combination of Artemia and Skretting fry feed). Feeding of the fry with the diets was done three times daily at around 8:00am, 1pm and 6pm. The experiment was laid out in a completely randomized design (CRD) with each treatment replicated three times.

2.2. Management Practice

The water was changed once every morning after siphoning of uneaten feed from the previous day. Changing of the water was done prior to feeding in the morning. Once every week, washing of the tanks, weighing of the fry and determination of feed consumed was carried out. This helped to keep the water temperature, pH, dissolved oxygen and ammonia under control.

2.3. Data Collection

Data on the following growth parameters were observed;
Weight gain (g)=$W_1 - W_0$
Where W_1=Final weight
W_0=Initial weight

$$\text{Survival rate (\%)} = \frac{\text{Final no}}{\text{Initial no}} \text{ x } 100$$

$$\text{Specific Growth Rate (\%)} = \frac{\text{Ln W2} - \text{Ln W1}}{time} \; x \; 100$$

Where W_1=Final weight
W_0=Initial weight
Ln=Natural logarithm
Time=Duration of the experiment

$$\text{Percentage weight gain} = \frac{\text{Weight gain}}{\text{Initial weight}} \text{ x } 1002.7$$

2.4. Data Analysis

Data obtained from the experiment were analysed using one-way analysis of variance (ANOVA) and treatment means were separated using Duncan multiple range test where significant differences exist ($P<0.05$) by using SPSS package version 20.

3. Results

The result of the experiment (Table 1) showed that there was significant difference ($p<0.05$) among the treatments in terms of final mean weight with treatment A (Artemia only) having the highest value (0.07±0.01) while treatments B and C showed no significant difference ($p>0.05$) between them. Weight gain was observed to be higher in treatment A (0.07±0.01) followed by treatment C (0.06±0.01) and the least value was observed in treatment B with a mean value of 0.05±0.01 and there was significant difference ($p<0.05$) between the treatments.

Survival rate was observed to be higher in treatment A (73.33) followed by treatment C (50.00) while the least value was observed for treatment B (46.67) and there was significant difference between the treatments. Percentage weight gain showed significant difference among the treatments with treatment A having the highest value followed by treatment B and the least was observed in treatment C. Significant difference ($p<0.05$) was also observed between the treatments in terms of specific growth rate which showed that treatment A had the highest mean value of 23.13±0.55 followed by treatment C and B with 21.33±1.20 and 21.76±0.63 mean values respectively.

Table 1. *Growth performance and survival of C. gariepinus fry fed different starter diets.*

Treatments			
Parameters	**A**	**B**	**C**
Initial Mean Weight (g)	0.003±0.00	0.003±0.00	0.003±0.00
Final Mean Weight (g)	0.07±0.01[a]	0.06±0.01[b]	0.06±0.01[ab]

Treatments			
Parameters	**A**	**B**	**C**
Survival rate (%)	73.33±14.19[a]	46.67±10.26[b]	50.00±8.71[b]
Weight gain	0.07±0.01[a]	0.05±0.01[b]	0.06±0.01[ab]
Percentage weight gain	2455.55±192.45[a]	1900.00±333.33[b]	2011.11±192.45[ab]
Specific growth rate	23.13±0.55[a]	21.33±1.20[b]	21.76±0.63[ab]

Means with same superscripts on the same row are not significantly different (p>0.05).

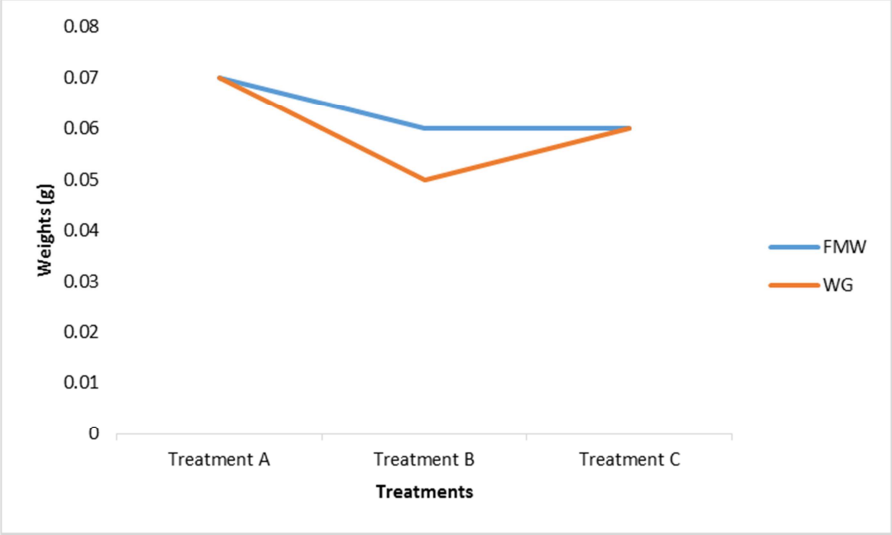

Figure 1. *Final Mean Weight and Weight Gain of fry fed different starter diets.*

The result of the experiment (Table 1) showed that there was significant difference (p<0.05) among the treatments in terms of final mean weight with treatment A (Artemia only) having the highest value (0.07±0.01) while treatments B and C showed no significant difference (p>0.05) between them. Weight gain was observed to be higher in treatment A (0.07±0.01) followed by treatment C (0.06±0.01) and the least value was observed in treatment B with a mean value of 0.05±0.01 and there was significant difference (p<0.05) between the treatments.

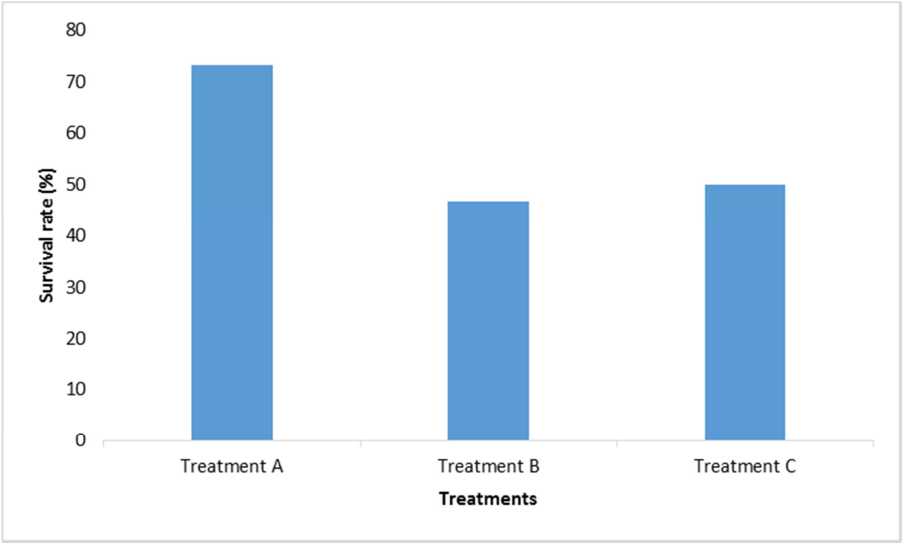

Figure 2. *Survival rate of fry fed different starter diets.*

Survival rate was observed to be higher in treatment A (73.33) followed by treatment C (50.00) while the least value was observed for treatment B (46.67) and there was significant difference between the treatments. Percentage weight gain showed significant difference among the treatments with treatment A having the highest value followed by treatment B and the least was observed in treatment C. Significant difference (p<0.05) was also observed between the treatments in terms of specific growth rate which showed that treatment A had the highest mean value of 23.13±0.55 followed by treatment C and B with 21.33±1.20 and 21.76±0.63 mean values respectively.

4. Discussion

The present study showed that Treatment A (Artemia) gave the best growth performance and highest survival rate (i.e. it records low mortality, compared to the other treatments) which agrees with the work of Olurin, *et al.,* [7] who compared the performance of decapsulated Artemia, Copepods and a commercial diet on the fry of African catfish. They attributed the best performance of Artemia to the fact that it had balanced nutrient composition compared to other starter feeds. The growth performance of *C. gariepinus* larvae fed on a combination of Artemia and Skretting fry feed was intermediate between those fed on Artemia only and those fed on Skretting only. It was observed that the growth rate of the larvae fed on Artemia was rapid and greater than the other treatments from start and was sustained up to the end of the experiment. This indicates that the use of Artemia as catfish starter diet can exceed beyond one week. This disagrees with the findings of Egwenomhe, *et al.* [10, 11] who opined that Artemia use as fish larvae diet should stop at one week. Several researchers reported Artemia as a good starter diet for freshwater and marine fish because of its balanced nutritional compositions [12-14].

Treatment B gave the least performance in all the growth performance parameters observed which indicates that the feed was not easily accepted by the fry especially at the start which could be as a result of the feed not being as palatable as Artemia since *C. gariepinus* fry depend so much on chemosenses rather than visual or mechanical senses when feeding [14].

5. Conclusion

It can be concluded from this study that C. gariepinus fry fed on Artemia has the best growth performance and survival which shows why Artemia has been the most used larval rearing diet on African catfish and this experiment demonstrated that Artemia can be used to feed fry for more than one week.

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