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Growth Performance and Survival Rate of *Clarias gariepinus* Fry Fed On Live Feeds *Brachionus calyciflorus, Ceriodaphnia reticulata* and Shell Free Artemia.

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Abstract

Fifteen days feeding trial was carried out in fish hatchery of Faculty of Agriculture, Nasarawa State University, Keffi, to assess the growth performances and survival rate of Clarias gariepinus fry fed on live feeds and and shell free Artemia. 25 fry each were placed in four aquaria in three replicates and were fed on four different treatment diets ('a': shell free Artemia; 'ab': Artemia shell free and Brachionus calyciflorus mixture; 'b': Brachionus calyciflorus; and 'c': Ceriodaphnia reticulata). Each treatment was aerated using aerator and ⅓ of the water was changed daily while feeding was done four times/day (treatment 'a': 5% body weight while all the live feed were washed clean with water and fed to the fish fry to satiation. Temperature (28.45±0.05^{0}C), pH (7.56±0.03); Dissolved Oxygen (4.50±0.03 mg/L), Total Alkalinity (15.36±0.03 mg/L) and Free Carbon dioxide (4.30±0.03 mg/L) monitored were each not significantly different ($p>0.05$) in the various treatments. No significantly different ($p>0.05$) in the result obtained from the total body length (1.60cm) of fry from all treatments but the values of specific growth rate (8.9), percentage weight gain (283%) and condition factor (69.17) in treatment 'c' were significantly higher ($p<0.05$) than other treatments. The percentage survival rate of the fry from "ab" (94.64), "b" (95.00), "c" (94.67) were not significantly different ($p>0.05$) from each other although they were significantly different ($p<0.05$) from "a" (90.33). These results show that the live feeds compete favourably with shell free Artemia in growth performance and survival rate of the C. gariepinus fry.

Key word: *Artemia, Brachionus calyciflorus, Ceriodaphnia reticulate, fry, live feed.*

Introduction

Many fish fry requires live food at the onset of exogenous feeding (Ovie and Ovie, 2002; Ibrahim, *et al.*, 2008). Zooplankton is a living food capsule from which the young growing fish hatchlings derive both macro and micro nutrients, especially the essential amino acids, vitamins, enzymes and in some cases antibiotics (Gatesoupe,1982). The success of fish hatchery operation all over the world is intricately linked to the ready availability and supply of natural feed, notably zooplankton organisms. Madu *et al.* (1990) showed that within the first weeks of life, the food of mudfish fry are predominantly zooplankton such as *Moina, Brachionus, Daphnia* and *Ceriodaphnia* while Adigun (2005) reported that the quality of the nutrient composition of freshwater zooplankton is important to the growth and survival of freshwater fish of the fry. Live food such as *C. reticulata* and *B. calyciflorus* are common freshwater zooplankton which can be produced in high population density but is not ascertained that they can compete with shell free *Artemia* in production of *C. gariepinus* fry. The prohibitive cost of importation of shell free *Artemia* has made this organism less viable economically as a natural larval feed especially in developing countries. This call for an immediate concern especially as the most expensive cost item in intensive fish farming could constitute 40% to 60% of the recurrent expenditure (Adigun, 2005).

C. gariepinus (Claridae) is very popular to fish farmers for high market price, fast growth rate, good food conversion ratio, resistance to diseases infection and ability to withstand adverse pond conditions especially low oxygen content and high turbidity. The culture of *C. gariepinus* fry as seed for fish production is becoming increasingly essential as the fish is contributing to the food abundance and nutritional benefit to family health, income generation and employment opportunities (Bamidele, 2007).

Materials and Methods.

The experiment was carried out in Fish Hatchery, Fisheries Unit of the Faculty of Agriculture Shabu-Lafia Campus, Nasarawa State University, Keffi. 25 individual fry of 3 days of age were placed in a 4-litre aquarium in three treatments of 3 replicates for 15 days in Fish Hatchery. The aquaria were static and placed indoor but aerated continuously with battery aerator. 1/3 of the water was change with fresh water daily. Initial average length (cm) and weight (g) of the fry were taken. The following feeds were fed to the fry as the treatment diets: 'a' shell free *Artemia,* 'ab*'* Artemia shall free and live *Brachionus calyciflorus* mixture in ratio 1:1, 'b' *Brachionus calyciflorus* and 'c' *Ceriodaphnia. reticulate. B. calciflorus* and *C. reticulate* were raised in monoculture tanks fed on fermented liquid manure to boost the growth of the zooplankton daily at 4ml/L (Okunsebor and Ofojekwu, 2009) in Research Teaching Farm of Faculty of Agriculture Lafia Campus.

Hatchery raised gravid brood stocks, (male weighing 0.9kg and female weighing 0.8kg) *C. gariepinus* were selected and prior to injection, the brood stocks were kept singly in aerated 1x 2x2m pond with 200 litres of water. The injection was done with 2ml syringe intramuscularly (0.4ml of ovaprim) above the lateral line toward the anterior end of the fish. The injected fish were returned into their various tanks. (Hamffa and Sridhav, 2002).

Stripping took place 9 hours after injection at 28^0C while the male fish was sacrificed and the milt was prepared for fertilization of the stripped eggs using normal saline. The eggs were carefully stirred with chicken feather for fertilization to effectively take placed. The eggs were spread evenly on pretreated Kakaban and the aquaria were kept under controlled temperature. After 24 hours, hatched eggs were collected and the fry were not fed until the third day after the hatching. The water was aerated continuously to increase the dissolved oxygen of the water and one third of the water in each aquarium was changed with clean water daily.

The hose and the bowl were placed not more than 20cm below the bottom surface of the hatchery trough (Viveen, *et al.,* 1986) when distributing the 25 fry per aquarium for acclimatization before the feeding treatment began 3 days after hatching. About 1/3 of the water in each aquarium was changed daily in order to create favourable condition for the fry. (Viveen, *et al.,* 1986).

C. reticulata and *B. calyciflorus* were harvested using 100µm zooplankton net at density 200/ml. The organisms were rinsed on a submerged filter in clean water consisting of 2 filter screens. The upper mesh size (200µm) retains large waste particles, while the lower sieve (100µm) collects the washed organisms. Feeding was done four times/day (treatment at 5% body weight while all the live feed were washed clean with water and fed to the fish fry to satiation not less than 100 live organism/fry/meal (Adigun, 2005)

Percentage weight gain of *C. gariepinus* fry within the period of the experiment was calculated as stated below (Cheikyula and Ofojekwu, 2003 ; Adewolu *et al*., 2008). Percentage weight gain (PWG) = 100 (W_2-$W_{1/}$ W_1). Where W_2 = final mean body weight and W_1 = initial mean body weight. Specific growth rate of the fry in the period of experiment was determined as stated below Specific growth rate (SGR) =100 (Log_e w_2 – log_e $w_{1)}$ $_/$ (T_2 – T_1). Where w_2 = final weight, W_1 = initial weight, Log_e = Natural log to base e, T_2 = Final weight in days, T_1 = Initial weight in days. (Adewolu *et al*., 2008). Total body length of the fry was measured in centimeter. The fry were placed with water into transparent glass to determine the total length with help measuring tape (Karl *et al.,* 1977). The condition of the fry was calculated according to (Madu *et al.,* 2003). Condition factor (K) = $100w/L^{3.}$ Where w = weight of fish in (g), L = length of fish in (cm). The percentage of survival the fry within the duration of the experiment was calculated (Cheikyula and Ofojekwu, 2003; Odedeyi , 2007)). Percentage survival rate = 100 (No. of fry that survived / Total No. of fry that start the treatment in each aquarium)

Temperature (^{O}C), pH (Hydrogen ion concentration), Alkalinity (mgL^{-1}), Free Carbon oxide (mg/L) and Dissolved Oxygen (mL^{-1}) in water used for each treatment were collected in depth of 2cm below the water surface. The methods of APHA/AWWA/WPCF (1985) were employed. The data obtained were analyzed using descriptive statistics, analysis of variance and Duncan's multiple range test for the level of significant difference at 0.05 probability.

Results and Discussion

The monitored water quality parameters in this study are showed in table 1. The result showed that Temperature for each of the treatment 'a', 'ab', 'b' and 'c' in all the treatments were not significantly different (p>0.05) from each other. Similar results of insignificant difference were recorded for Carbon dioxide, Total alkalinity, dissolved Oxygen and pH throughout the period of the experiment. Results of each treatment were not altered by water parameters in this experiment as they were not significantly different in the treatments. The average temperature, dissolved oxygen, total alkalinity and carbon dioxide for the various treatment observed in this study were within acceptable range (Adewumi, 2009).

Table 1 Water quality parameters during the period of the study.

Parameter	a	ab	b	c
Temperature (^{o}c)	28.13±0.06	28.03±0.06	28.16±0.03	28.47±0.06
PH	7.55±0.03	7.56±0.03	7.57±0.03	7.56±0.03
Total alkalinity (mg-^{1})	15.11±0.03	15.11±0.03	15.11±0.03	15.11±0.03
Dissolved oxygen (mg-^{1})	4.50±0.03	4.50±0.03	4.50±0.03	4.50±0.03
Carbon dioxide (mg-^{1})	4.30±0.03	4.30±0.03	4.30±0.03	4.30±0.03

The results of the effects of the treatments on the total body length of *C. gariepinus* fry were showed in figure 1. All the treatments favoured total body length of the fry and the result obtained showed no significant difference (p> 0.005) in the treatments. Similar report was also observed in Ojutiku, *et al.,* 2004. Figure 2 showed the results of the condition factor of the fry. The best condition factor was recorded in treatment 'c' (69.17) and were significantly different (p<0.05) from each others. Treatment 'a' had the lowest condition factor (61.80) while and 'ab' (64.58) and 'b' (64.58) were not significantly different (p>0.05) from each other. The condition factor is one of the indicators of fish condition (Welcomme, 2001). Pauly (1983) also stated that condition factor of a fish is concerned with the well-being and the degree of fitness of fish in a given water body.

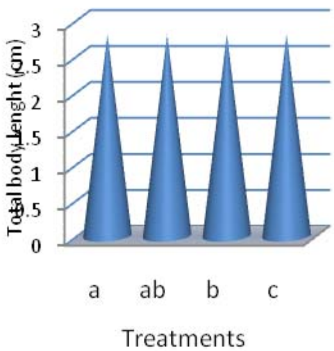

Figure 1: Effect of treatments on total body length of *C. gariepinus* fry.

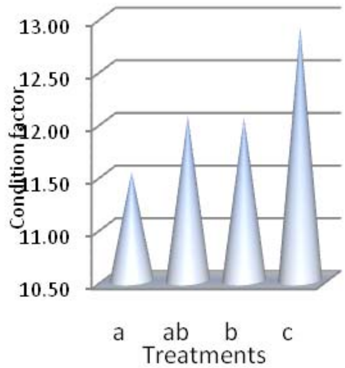

Figure 2: Effect of treatments on condition factor of *C. gariepinus* fry.

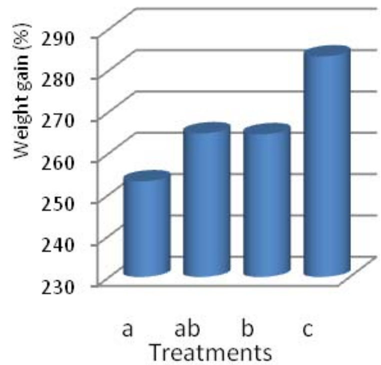

Figure 3: Effect of treatments on percentage weight gain of *C. gariepinus* fry.

Figure 3 showed the percentage weight gain exhibited by *C. gariepinus* fry fed with various treatments. The result showed that treatment 'c' had the highest percentage weight gain of (283) which is significantly different ($p<0.05$) from the other treatments. Treatment 'a' (253) had the lowest percentage weight gain while the results from 'ab' (265) and 'b' (265) were not significantly different from each ($p>0.05$). The percentage weight gain obtained from the results agrees with Obasa, *et al.* (2009). The choice of live feed by *C. gariepinus* fry can be attributed to their nature as carnivorous fish and utilizable nutrient content of the feed..

The results of percentage survival rate of *C. gariepinus* fry in this study are showed in figure 4. The percentage survival rate of the fry of treatments 'ab' (94.64±0.33), 'b' (95±0.003), and 'c' (94.67±0.33) were not significantly different ($p>0.05$) from each other while treatment 'a' (90.33±0.33) was the lowest. The percentage survival rate of all the treatments are within acceptable range according to Balogun, *et al.* (2004); Alatise, *et al.* (2004). The lower percentage survival rate of fry fed shell free *Artemia* confirms the superiority of live feed in terms of nutrient composition and acceptability by the swimming fry during the experiment.

The results specific growth rate of fry obtained in this experiment are recorded in figure 5. Lowest at the values of specific growth rate are found in the treatments 'a' (8.4), 'ab' (8.4) 'b' (8.6) while treatment 'c' had the highest fry specific growth rate (8.9) and it is significantly different ($p<0.05$) from other treatments. In this study, treatment 'b' *B. calyciflorus* and 'c' *C. reticulata* which are live foods enhances the well been of the *C. gariepinus* fry in the hatchery. Treatment 'ab' which is the mixture of *artemia* shell free and *B. calyciflorus* brought about selectiveness and choice of preference of the feed material by the swimming *Clarias gariepinus* fry as reported by Madu *et al.* (1990).

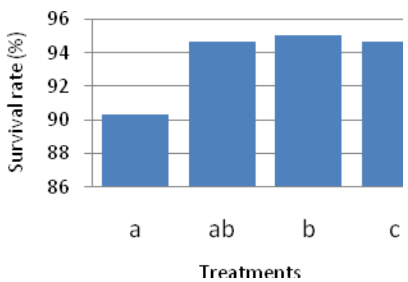

Figure 4: Effect of treatments on the percentage survival rate of *C. gariepinus* fry.

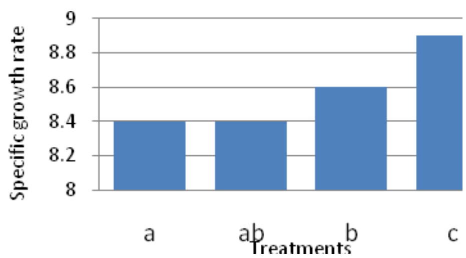

Figure 5: Effect of treatments on the specific growth rate of *C. gariepinus* fry

Conclusion

It can be inferred from these results that live feed (*B. calyciflorus* and *C. reticulata*) compete favourably with shell free *Artemia* in growth performances and they have a better condition factor of the *C. gariepinus* fry. The live *B. calyciflorus* or *C. reticulata* support high survival rate. The mixture of shell free *Artemia* and *B. calyciflorus is not economically needful.* All the treatment diets used in this study support total body length of the *C. gariepinus* fry

Recommendation

Live feed zooplankton (*B. calyciflorus* and *C. reticulata*) are recommended as alternative to shell free *Artemia* in hatchery for raising *C. gariepinus* fry because they compete favourably with shell free *artemia* in fry growth performance and survival rate. The live feeds are abundance in freshwater, easy to culture, easily digestible, affect not water quality and their small size are convenient for fry to feed on easily.

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