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The Growth and Survival of *Clarias* Gariepinus Fry Fed Various Dry Feeds (Baker's Yeast, Fishmeal, Egg Yolk, *Artemia* And Combination of *Artemia* And Fishmeal) With Cod Liver Oil as Supplement for Test Starter Diet

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ABSTRACT: *C. gariepinus* (0.02g) of 1 week old were subjected to five diets consisting of baker's yeast, fishmeal, chicken egg yolk, *Artemia* and the combinations of *Artemia* and fishmeal with a drop of cod liver oil as supplement to each treatment. The fry were fed to satiation daily and the study lasted for 5 weeks. At the end of the study, the respective treatments were compared on the basis of percentage weight gain, body length, survival rate, and condition factor. Fry fed on *Artemia* and fishmeal with a drop of cod liver oil were significantly higher (5.01cm and 2.8g for length and weight respectively and 95% survival of the fish fry) than those fed on other diets. This present research recommends that at larval to fry age *C. gariepinus* requires the combinations of *Artemia* and fishmeal with a drop of cod liver oil.

KEY WORDS: Diets, growth, survival and *Clarias gariepinus*

INTRODUCTION

Clarias gariepinus are freshwater fin fishes which are of the most suitable fish species for aquaculture in African (De Silva & Davy, 2010). *C. gariepinus* have a high growth rate and are very resistant to stress and handling, and just like the *Clarias anguillarias*, *C. gariepinus* are equally hardy and palatable which makes them attractive to consumers (Ezenwaji, 1985). Madu *et al.*, (1990) reported that *C. gariepinus* species are commercially very important in Nigeria and the females spawn readily under artificial and natural conditions but the survival of its fry is usually low because of the climatic and biological hazards associated with spawning. Aguigwo, (1999) stated that adequate supply of *C. gariepinus* fingerlings which is of great commercial importance is one of the major problems to modern fish farming. According to Kuo, Shehadeh, & Milisen, (1973) high fish mortality usually occurs within the first fifteen days of life. Under controlled conditions, attempts are made to obtain the highest possible numbers of good quality hatch (Brzuska, 2003). Knowledge of the nutritional requirements of the fish is therefor necessary to ensure healthy and optimal growth particularly in the larval stage. *C. gariepinus* is generally classified as an omnivore or predator as no consistent pattern on its food composition has emerged (De Graaf, *et al*., 1996). Micha (1973) reported that *Clarias lazera* which is of the same family as to *C. gariepinus* fed mainly on aquatic insects, fish and higher plant debris. At an early age *Artemia naulii* is the first choice feed for the newly hatched fry, under intensive culture. Sorgeloos, Dhert & Candreva, 2001; Conceicao, Yufera, Makridis, Morais & Dinis, (2010) however reported, increasing cost of *Artemia* is a constraint to fish farming among resource poor farmers in the developing world, which has necessitated the need for alternative feeds (Olurin, Iwuchukwu &

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Oladapo, 2012). Search for alternative proteins sources for fish feed continues (Absalom, Omoregie & Igbe, 1999; Ofojekwu, Onuoha & Ayuba, 2003). Attempts have been made to use inert diets solely (Appelbaum & Damme, 1988), but most studies using inert diets have not given satisfactory results (Govoni, Boehlert & Watanabe, 1986; Pelkam, Eric & Moodle, 2001). Attempts have also been made for the combination of inert diets with live foods for larval rearing (Chang, Liang, Wang, Chen, Zhan & Liu, 2006). However, most of this live food is deficient in some essential unsaturated fatty acids required for optimal growth of fish larvae (Olurin *et al.*, 2014). It is therefore the practice to enrich the inert and live food with these essential fatty acids. The aim of the present study is to investigate the level of acceptance, physical performance and condition of *Clarias gariepinus* fry when subjected to different locally prepared diets.

MATERIALS AND METHODS

Study area

The research was carried out in Plateau State, Nigeria in the automated thermo-controlled fish hatchery of Global Aquaculture and Allied Ventures (GAAV) in Jos-South, Plateau State. The farm has all the facilities (e.g., underground ponds, concrete tanks, plastic tanks, working space, standard hatchery, constant water and power supply) for induced breeding of this fish species.

Experimental design

Individual fry (40) of 1 week old were placed in 20-litre plastic tanks (Madu and Ufodike, 2001) in five treatments of 3 replicates and acclimatized for three days. At the end of the acclimatization period the number of fry in each plastic tank were reduced to 20 and the experiment lasted for 5 weeks within 2nd March - 4th April, 2015. Initial average length (cm) and weight (g) of the fry was recorded. The water in the plastic tanks was aerated continuously and $^1/_3$ of the water was changed with freshwater daily to create a favourable condition for the fry (Viveen, *et al*., 1986). The dry feeds for the study were baker's yeast, fishmeal (75% crude protein), egg yolk, *Artemia* shell free, *Artemia* shell free + fishmeal with a drop of cod liver oil as supplement mixed with the diets on each treatment as the experiment lasted (Table 9). The fry were fed to satiation daily. Baker's yeast, fishmeal, *Artemia*, and the cod liver oil were purchased from the market. Chicken eggs were hard boiled daily and the yolk removed, weighed and each daily ration was restricted to a particular treatment. The plastic tanks were observed daily for mortality and the dead fry were siphoned out immediately. Percentage weight gain, total body weight, the condition factor and percentage survival rate were collected using the formulae below.

a) Percentage weight gain of *Clarias gariepinus* fry within the period of the experiment was calculated according to (Cheikyula & Ofojekwu (2003); Adewolu, Ogunsanmi, & Yunusa, (2008).

Percentage weight again (PWG) = $\{(W_2-W_1) / W_1\}$ X 100

Where W_2 = final mean body weight and W_1 = initial mean body weight.

b) Total body length of *Clarias gariepinus* fry fed from various treatments was measured in millimeter. The fry was placed with water into transparent glass dish to determine the total length with the help of a measuring tape (Karl, John, Robert, & Dora, 1977).

c) The condition factor of *Clarias gariepinus* fry was calculated according to (Madu & Ufodike, 2003). Condition factor $K = 100W/L^3$. Where w = weight of fish in (g), L = length of fish in (cm).

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d) The percentage of survival of *Clarias gariepinus* fry within the duration of the experiment was calculated using the formula below (Cheikyula & Ofojekwu, 2003; Odedeyi, 2007).

$$\text{Percentage survival rate} = \frac{\text{No. of fry that survived} \times 100}{\text{Total No. of fry that started the treatment in each bowl}}$$

RESULTS

The result showed that the treatment of *Artemia* shell free + fishmeal + cod liver oil mixture with 150.5g significantly has the best results in weight gain, followed by *Artemia* + cod liver oil (90.5g), fishmeal + cod liver oil (71.5g) and egg yolk + cod liver oil (36g) respectively. The least in the percentage weigh gain was found in baker's yeast + cod liver oil (16g). *Artemia* shell free + fishmeal + cod liver oil, *Artemia* + cod liver oil, fishmeal + cod liver oil treatments showed values higher than 70% and were not significantly different ($p>0.05$) from each other. Treatments of egg yolk + cod liver oil and baker's yeast showed the lowest percentage ($p<0.05$) weight gain.

The results of the total body length of *Clarias gariepinus* fry are shown in Figures 2. The total body length of *C. gariepinus* fry fed on *Artemia* and those of fishmeal were not significantly different ($p>0.05$) from each other although they were longer than those of the other treatment groups. Length of fry fed on *Artemia* shell free + fishmeal + cod liver oil, *Artemia* + cod liver oil and fishmeal + cod liver oil gave 2.8cm, 2.1cm and 1.9cm respectively. The least of the body lengths were recorded on treatments of baker's yeast (1.3cm) followed by chicken egg yolk + cod liver oil at 1.5cm. Therefore, *Artemia*, fishmeal and mixture of both supplemented with cod liver oil increase the total body length of *C. gariepinus* fry within 5 weeks of the experiment as they were significantly the same ($p<0.05$).

The result of the survival rate of *Clarias gariepinus* fry in this experiment is shown in Figure 3. Results of percentage survival rate of *Clarias gariepinus* fry fed on *Artemia* shell free + fishmeal + cod liver oil (95%), *Artemia* + cod liver oil (85%) and fishmeal + cod liver oil (75%) treatments groups showed values higher than 70% and were not significantly different ($p>0.05$) from each other although treatment of *Artemia* shell free + fishmeal + cod liver oil reached 95% survival rate. The least result was recorded on baker's yeast + cod liver oil with 15% followed by egg yolk + cod liver oil with 65%.

Results of condition factor of *Clarias gariepinus* fry fed various dry feeds and cod liver oil as its supplement shows that *Artemia* + cod liver oil (60.1) and *Artemia* + fishmeal + cod liver oil (59.4) recorded the highest condition factor and it is significantly different ($p<0.05$) from the results of other treatments. In the case of baker's yeast treatment group the condition factor results were the lowest with 17.9.

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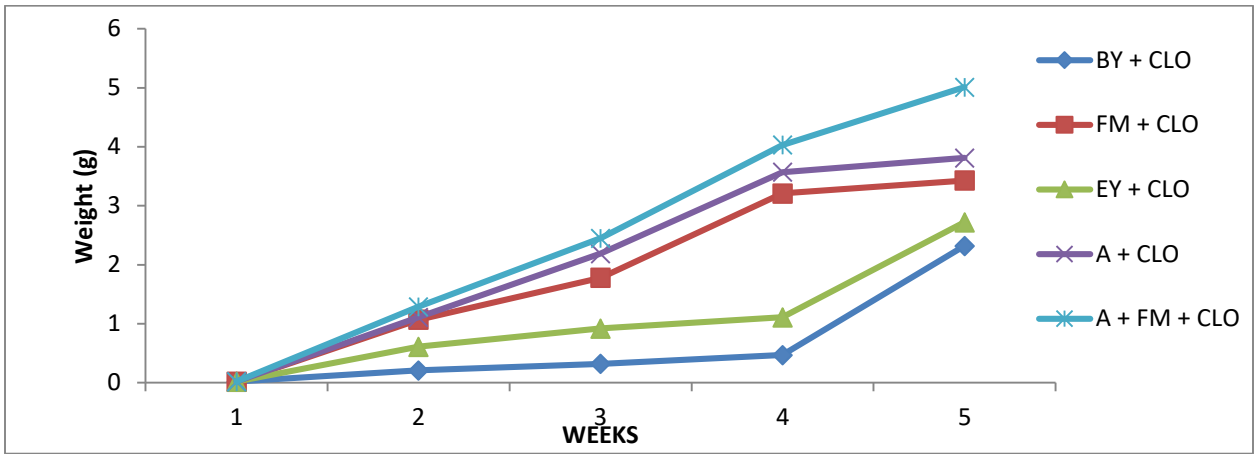

Figure 1: Weight of *Clarias gariepinus* hatchlings fed various dry feed (baker's yeast, fishmeal, egg yolk, *Artemia* and combination of *Artemia* and fishmeal) with cod liver oil as supplement for test starter diet

Legend: BY + CLO = Baker's yeast + Cod Liver Oil; FM + CLO = Fish meal + Cod Liver Oil; EY + CLO = Egg yolk + Cod Liver Oil; A + CLO = *Artemia* + Cod Liver Oil; A + FM + CLO = *Artemia* + Fish meal + Cod Liver Oil.

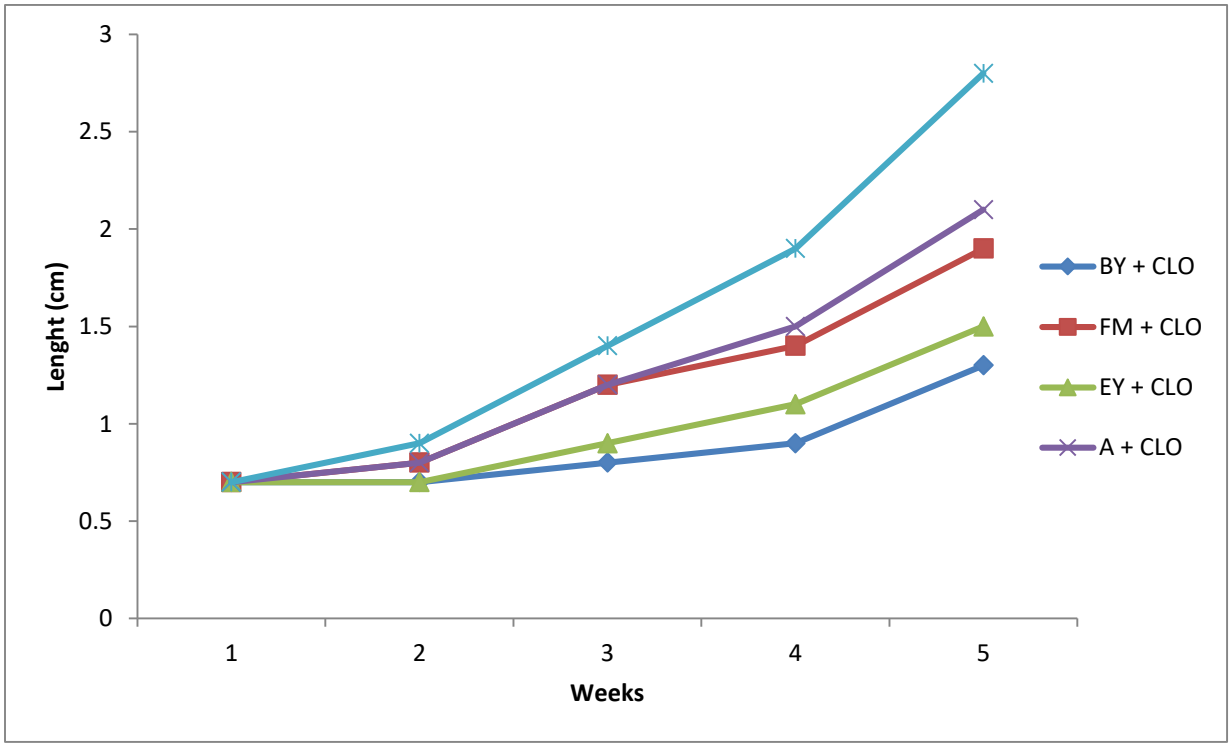

Figure 2: Length of *Clarias gariepinus* hatchlings fed various dry feed (baker's yeast, fishmeal, egg yolk, *Artemia* and combination of *Artemia* and fishmeal) with cod liver oil as supplement for test starter diet

Legend: BY + CLO = Baker's yeast + Cod Liver Oil; FM + CLO = Fish meal + Cod Liver Oil; EY + CLO = Egg yolk + Cod Liver Oil; A + CLO = *Artemia* + Cod Liver Oil; A + FM + CLO = *Artemia* + Fish meal + Cod Liver Oil.

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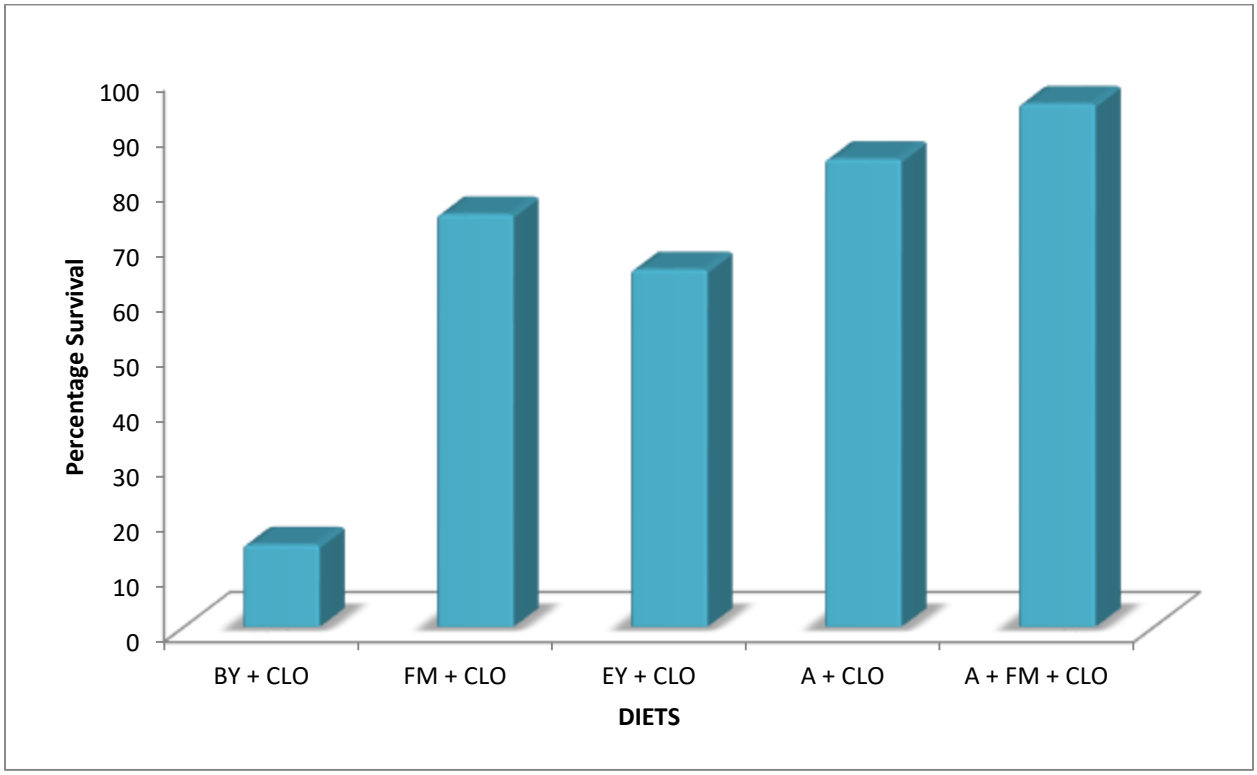

Figure 3: Percentage survival of *Clarias gariepinus* hatchlings fed various dry feed (baker's yeast, fishmeal, egg yolk, *Artemia* and combination of *Artemia* and fishmeal) with cod liver oil as supplement for test starter diet

Legend: BY + CLO = Baker's yeast + Cod Liver Oil; FM + CLO = Fish meal + Cod Liver Oil; EY + CLO = Egg yolk + Cod Liver Oil; A + CLO = *Artemia* + Cod Liver Oil; A + FM + CLO = *Artemia* + Fish meal + Cod Liver Oil

DISCUSSION

Selection of feed ingredients is one of the most important factors for the formulation and commercial production of supplemental quality feed for any aquatic species (Zamal, Barua, Uddin, & Islam, 2008; Koumi, Atse, & Kouame, 2009). In this study, the best growth responses and survival in terms of body weight, total body length, condition factor and percentage survival rates were obtained in "*Artemia* + fishmeal + cod liver oil". This might be attributed to the fact that the diet contained various food sources of different textures and sizes. Thus, giving the hatchlings a wide range of diets to feed on. While, the almost total mortality of hatchlings observed in treatment "Baker's yeast + cod liver oil" could be as a result of non-acceptance of the diet fed to the hatchlings. This agrees with the observation of Madu *et al*., (1990) on the food and feeding habits of mudfish hatchlings as they grew.

Also, both treatment (*Artemia* + fishmeal + cod liver oil and Fishmeal + cod liver oil) had fishmeal on them and performed highly, suggesting that fishmeal could form an important component of the diets of catfish hatchlings. As similar observation were reported by Madu *et al*., (2001) for

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Clarias anguillarias and Fermin & Bolivar, (1991) for *Clarias macrocephalus* respectively. The fishy flavor and the high content of good quality protein in fishmeal are usually an important factor in fish nutrition (Robinson & Lovell, 1984; Lovell, 1989).

The cod liver oil also added to the high condition factor of the fry as it contains vital vitamins and amino acids which are essential for good growth. However, it was observed from the growth curves, that diets containing fishmeal started performing well only after the first week of the experiment this agrees with Madu & Ufodike (2001) on the growth and survival of mudfish hatchlings fed on various natural and artificial feeds as test starter diet for indoor nursery management. Therefore, fishmeal diets are not suitable during the first week. The best diet during the first week was recorded in treatments containing *Artemia* (*Artemia* + fishmeal + cod liver oil) but after the first week, treatment containing Fishmeal + cod liver oil remarkably reduced in its performance. This implies that for the best growth and survival rates of *Clarias gariepinus* fry within the first week of feeding, *Artemia* diet should be considered as the most suitable first food. A combination of *Artemia* shell free, fishmeal and cod liver oil which was the overall best diet, should be considered for the feeding management of *Clarias gariepinus* fry.

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