EFFECT OF DIFFERENTLY PRESERVED EGGS ON GROWTH AND SURVIVAL OF *Clarias gariepinus* FRY

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ABSTRACT
In this study, the performance of differently preserved eggs on the growth performance, condition factor and survival rate of Clarias gariepinus fry was studied. The experiment consisted three (3) treatments replicated three (3) times in a completely randomized design. One hundred (100) Clarias gariepinus fry were stocked per replicate under flow through system and were fed supplemented feed of differently preserved egg (EODPE 1 was the control and was fed artemia, EODPE 2 was fed oven dried egg while EODPE 3 was fed hard-boiled egg). Feeding was done ad-libitum for 16 days. Water quality parameters were monitored and maintained at optimum levels for freshwater fish culture. Results revealed that percentage mean weight gain (412.6%), specific growth rate (11.662%/g/day), percentage increase in length (5555.6%) and condition factor (1.1631) were significantly high in EODPE1 than EODPE2 and EODPE3. Survival rate was the highest (74.0%) in EODPE3. Commercial fish farming, practicing catfish fry culture are recommended to raise their larvae on oven-dried egg as starter feeds for the purpose of enhancing faster growth performance.
Keywords: Preserved eggs, Growth performance, Survival rate, Condition factor; *Clarias gariepinus*.

INTRODUCTION

Lack of readily available nutritive fish feed ingredients have continued to be a major constraint to the survival of aquaculture in the competitive global food production system (Ogunji *et al*., 2005; FAO, 2006). Consequently, fish nutrition experts, world over have considered the recruitment of alternative protein feed ingredients necessary for inclusion in fish diet. Several studies have shown that vegetable protein sources have high potentials for supplying fish with required protein needed for their maximum productivity (Nwanna *et al*., 2008). However, in the compounding of fish ration with animal protein sources, cautions need to be exercised as to their inclusion levels in fish diets as well as ensuring their proper processing for effective utilization (Francis *et al*., 2001). The need for such recommendations have been due to the presence of certain limiting factors in those ingredients such as high crude fibre content (Nwanna *et al*., 2008). Fish is the primary source of protein for about 950 million people worldwide and represents an important part of the diet of many people, provide about 10% of the animal protein consumed by humans and is a valuable source of minerals and essential fatty acids (FAO, 1997). Fish consumption is growing at the rate of 2.4% per annum, while the human population is increasing at the rate of 2% per annum. Thus, the growth of population is outpacing that of fish as food since 1980; creating increasing market demand. This has led to the overexploitation of capture fisheries due to overcapacity and over fishing. Hence, there is need for increased aquaculture production to supplement the capture fisheries and solve the market demand of fish and fish products. The species selected to portray yield potential in Africa for aquaculture production are African catfishes, Nile tilapia (*Oreochromis niloticus*) and Common carp (*Cyprinus carpio*). These species are widely distributed and have already performed well for fish farming in the continent. Under small-scale conditions, African catfish because of its tolerance to crowding produces a critical standing crop of about 21 metric tonnes under commercial farming (FAO, 2006). An omnivorous scavenger that eats everything it finds, the African catfish is particularly amenable to the farming practices of smallholders, who comprise the majority of farmers in developing countries. It is also favoured for controlling tilapia recruitment because it fetches higher market prices than other species. However, the persistent lack and/or high price of even small catfish fingerlings in such countries is a major constraint to aquaculture development (Sulem *et al*., 2006).

African catfish (*Clarias gariepinus*), from a biological perspective, is undoubtedly the ideal aquaculture specie in the world. It is widely distributed, thrives in diverse environments (temperate to tropical), and is hardy, adaptable, and an ecological pioneer species, principally as a major consequence of its air-breathing ability. It feeds on a wide array of natural prey and can adapt its feeding habits depending on food availability. It is able to withstand adverse environmental conditions, and is highly fecund and easily spawned under captive conditions (Nyina-Wamwiza *et al*., 2010).

MATERIALS AND METHODS

Research Area

The experiment was conducted at the Fisheries Unit of the Experimental Farm of the Department of Aquaculture and Fisheries Management of the Faculty of Agriculture, Nasarawa State University Keffi, Shabu- Lafia Campus. Lafia is located on latitude 8° 35'N, longitude 8° 32'E, altitude 181.53m above sea level with a mean temperature of 34°C, relative humidity of 40-86% and average day light of 9-12h (NIMET, 2011).

Procurement and Acclimation of Experimental Fish

Clarias gariepinus bloodstocks were sourced from a reputable fish farm. They were acclimatized for a period of seven days, during which they were fed four times daily. The broodstocks were used for breeding to obtain the fry that was used for the study. Nine hundred (900) *Clarias gariepinus* fry was used for the study.

Experimental Set Up

Water was pumped from the Department's farm borehole into over-head tanks for settling after which water was released into the experimental units. Plastic bowls were used for the study. The bowls were filled with water uniformly and 100 *Clarias gariepinus* fry were randomly stocked in each bowl. The fish were starved for twenty-four (24hrs) to maintain uniform stomach condition and to induce their appetite prior to the use of experimental diets. The experiments consisted of three treatments replicated three times in a completely randomized design. EODPE 1 was the control and was fed artemia, EODPE 2 was fed hard-boiled egg while EODPE 3 was fed oven-dried egg. The fish were fed to satiation for 16 days. Water quality parameters (DO, pH, temperature, carbon dioxide and ammonia) were kept in acceptable level for fish throughout the experimental period by flow through system.

Data Collection

Initial mean weight of the fish was determined by weighing using sensitive weighing balance after which regular sampling for mean weight changes were taken at two weeks' intervals for 8 weeks. The data was collected and was processed for growth assessment and nutrient utilization. The following formulae were used to determine feed utilization and growth performance of the experimental fish according to methods described by Jobling (1983).

Percentage mean weight gain (PMWG)

This is calculated using the formula:

$$PMWG = \frac{(Wf - Wi)}{Wi} \times 100 \qquad (1)$$

Where, Wf is final mean weight and Wi is initial mean weight

Specific growth rate (SGR)

The SGR was calculated using the formula below:

$$SGR = \frac{(1n\ Wf - 1n\ Wi)}{T\ (days)} \times 100 \qquad (2)$$

Where, Wf= final mean weight, Wi= initial mean weight and T = culture period

Length

This was taken by measuring the total length from the tip of the snout to the end of the caudal fin using a ruler calibrated in centimetres.

Condition factor

The condition factor of the *Clarias gariepinus* fingerlings fish after the experiment was calculated as:

$$CF = \frac{W}{L^3} \times 100 \qquad (3)$$

Where, W = Weight (g), L = Length (cm)

Survival Rate

$$\text{Survival rate \%} = \frac{\text{No of fish survived at the end of experiment}}{\text{Initial number of fish stocked}} \times 100 \qquad (4)$$

Statistical Analysis

Data obtained was analysed using one-way Analysis of variance (ANOVA) and significant mean differences were separated at 0.05 probability level as described by Steel *et al*. (1997).

RESULTS AND DISCUSSION

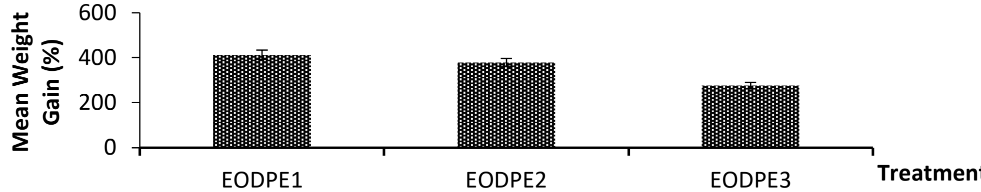

Figure 1: Percentage mean weight gain of fry fed with differently preserved egg

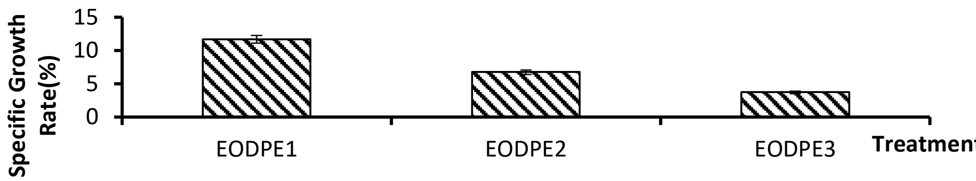

Figure 2: Specific growth rate of fry fed with differently preserved egg

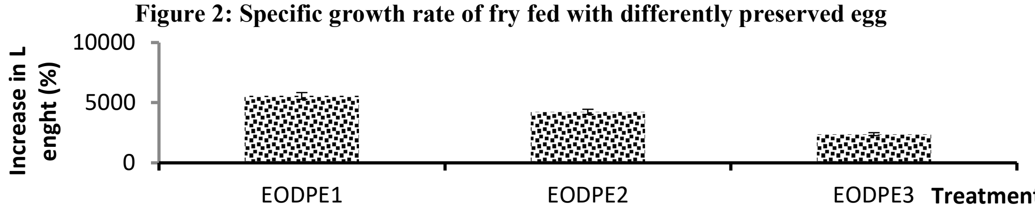

Figure 3: Percentage increase in length of fry fed with differently preserved egg

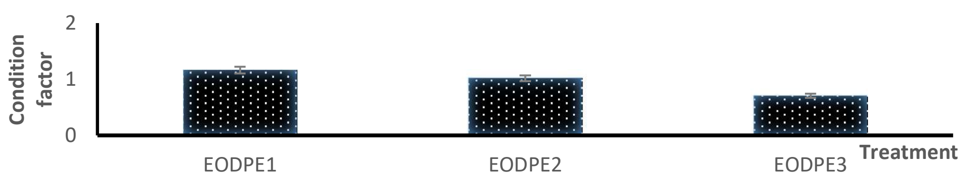

Figure 4: Condition factor of fry fed with differently preserved egg

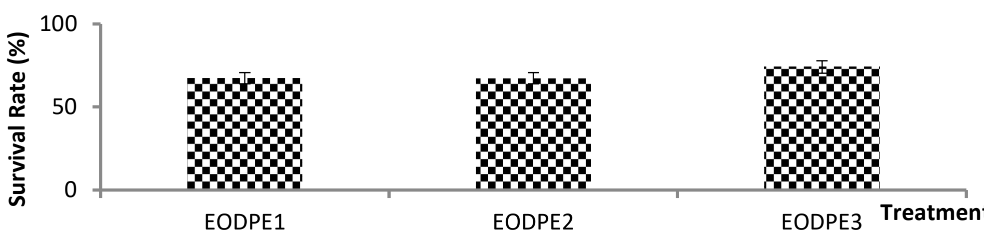

Figure 5: Survival rate of *Clarias gariepinus* fry fed differently preserved eggs

EODPE 1 = Effect of differently preserved eggs (Artemia)
EODPE 2 = Effect of differently preserved eggs (Oven-dried egg)
EODPE 3 = Effect of differently preserved eggs (hard-boiled egg)

Growth studies on catfish fry rearing have indicated differences in performance of various starter feeds for African catfish. Over the year's workers on a number of cultured fish species have shown growing concern of reducing the cost of weaning larvae by introducing early micro diets (Gordon *et al*., 2000; Liu *et al*., 2012). This study illustrated successful rearing of the catfish fry exclusively on artemia alone. Growth performance of the *Clarias gariepinus* fry was significantly influenced by artemia feed. Fry fed on artemia showed superior growth over those fed on oven dried egg and hard-boiled egg.

In previous studies by (Lim *et al*., 2003) involving the larvae of African catfish (*Clarias gariepinus*), Artemia also gave the best growth performance in terms of weight gained. Artemia have also been reported as a good starter diet for freshwater and marine fishes (Person, 1989) because of its balanced nutritional composition. The specific growth rate recorded in this study is in line with the findings of Cassius *et al*. (2017) of *Clarias gariepinus* fed on different diets. The lower growth observed in *Clarias gariepinus* fry fed hard-boiled egg can be as a result of the preservation method used and high protein content of egg. Dupree and Huner (1984), reported that weight gain in fish is directly proportional to the protein content of the diet provided the levels of protein does not exceed 50%. Cho *et al*. (1985) reported a 25% crude protein in diet as adequate for catfish fry rearing in order to obtain optimum growth in intensive culture. The specific growth rate obtained in this study was between 3.17-11.66. This result is higher than the maximum average SGR values (4.07-4.19) calculated in *Clarias gariepinus* after a 10-day feeding period with artemia (Verreth and Bieman, 1987).

Significant differences were found among treatments in total length (TL) over the culture period. Fish growth for the culture duration appears to have been influenced by the type of diet. The growth in length of fry in this study was considered to be significantly higher than what has been reported in the literature. Verreth *et al*. (1993) reared *Clarias gariepinus* larvae for 10 days on decapsulated artemia cysts. They obtained a mean TL of (15.954 ± 1.021 mm) after 10 days. Their results showed higher growth compared to results obtained in this study.

Condition factor of fry fed artemia and differently processed eggs was below 3.0 which is an indication of low wellbeing. Condition factors value from 3 and above indicates a robust fish while values below 3 indicates a lean fish (Le Cren, 1951).

A major advantage of artemia in aquaculture is that they can be kept for a longer periods of time. In terms of growth fish fed with artemia did better, while survival rate was better in *Clarias gariepinus* fry fed with oven-dried and hard-boiled egg. This result agrees with the report of Abduraheem *et al*. (2012), who obtained lower survival in *Clarias gariepinus* larvae fed live feed (artemia) and higher in artificial feeds. Like other live feeds such as artemia, this implies that the fry did not have fully developed guts, as well as poor perception organs such as the olfactory. Even fry could die with guts full of food, suggesting their inability to digest formulated diets.

Better growth performance on artemia feed could be attributed to increased high density unsaturated fatty acids (HUFA) contents of the feed (Qin *et al*., 1997).

CONCLUSION

From the results of this study, it is concluded that artemia significantly improved the growth of *Clarias gariepnius* fry compared to hard-boiled egg. Fry fed with oven-dried and hard-boiled egg had higher survival rate compared to fry fed artemia.

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