PERFORMANCE OF AFRICAN MUD CATFISH (*CLARIAS GARIEPINUS* BURCHELL, 1822) HATCHLINGS FED BAKER'S YEAST, EGG YOLK AND MILK POWDER AS STARTER DIETS

***Ali, M. E.[1], Yusuf, S. K.,[1] Maisheru, J. A[1]., Ekaette, E. E[2]., Nababa, A. S[3]., Idris, M.[4], Yahaya, I.[4], Useni, S. S[1]. and Yusuf, Z. A.[5]**

[1]National Biotechnology Development Agency, Billiri, Gombe State, Nigeria
[2]National Biotechnology Development Agency, Arochukwu, Abia State, Nigeria
[3]Department of Fisheries and Aquaculture, Federal University Dutsin -Ma, Katsina State, Nigeria
[3]Department of Fisheries and Aquaculture, Federal University of Lafia, Nasarawa State, Nigeria
[41]National Biotechnology Development Agency, Katsina, Katsina State, Nigeria
[5] Department of Fisheries and Aquaculture, Federal University of Lafia, Nasarawa State, Nigeria
**Corresponding Author: mealikumbo@gmail.com 080341935792*

ABSTRACT

Feeding trials involving the use of four different starter diets; shell-free Artemia which served as the control (T_0), baker's yeast (T_1), chicken egg yolk (T_2) and milk powder (T_3) were carried out. For the feeding of Clarias gariepinus hatchlings, was carried out at the hatchery room of the National Biotechnology Development Agency, Katsina, Diets were fed to *hatchlings (n = 1,200, 0.28±0.0g)* for 28 days in *twelve hatchery tanks (n = 100). Hatchlings were fed at a fixed feeding rate of 10% body weight six times daily between the hours of 07:00 and 23:00 at regular interval. Data obtained were analyzed using One - way ANOVA at P = 0.05. There was no significant difference (p>0.05) in the mean weight gain, daily growth rate, specific growth rate and feed conversion ratio of hatchlings fed T_0, T_2, and T_3, except for the hatchlings fed T_1. The higher survival rate values recorded from both the hatchlings fed T_0 and T_2 indicated that these diets were well utilized by the hatchlings and does not have any negative effect on the water quality parameters, while the lower survival rate values recorded from both the hatchlings fed T_1 and T_3 was due to nutrient leach in the baker's yeast and the milk powder which quickly dissolve in water, thereby causing pollution, which have negative effects on the survival rate of the hatchlings. Findings from this study indicated that use of boiled chicken egg yolk is encouraged in the culture of C. gariepinus hatchlings as alternative to shell-free Artemia as starter diets.*

Keywords: *Clarias gariepinus;* Hatchlings, Baker's yeast, Egg yolk, Milk powder

INTRODUCTION

The culture of species of the catfish belonging to the family Clariidae is fast gaining global attention in recent years. African mud catfish commonly cultured in Nigeria includes *Clarias gariepinus* and *Clarias anguillaris*, *Heterobranchus longifilis* and *Heterobranchus birdosalis* and their hybrids (Onyia *et al.,* 2015; Ishaku *et al.,* 2023). The reason for their suitability for culture include, their ability to withstand poor water quality, high stocking density, stressed condition and high feed conversion efficiency amongst others (Sogbesan, 2023). Commercially their production is yet to meet the demand of the populace due to high cost of feed and insufficient good quality seed (Sogbesan, 2014). Aquaculture nutritionists are of the opinion that, there are important gaps in the knowledge of how to administer feed to *Clarias* larvae in order to obtain both optimal growth and a high survival rate (Onyia *et al.,* 2015). 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 (Adewumi, 2015). Shell-free *Artemia* is a commercial starter diet (54% crude protein) and has been rated high for better growth and survival as *C. gariepinus* fry diet (Ali, 2015). The cost and locally none availability couple with the prohibitive cost of importation of the shell-free *Artemia* has made its use less viable economically as a first choice fry feed, especially in developing countries such as Nigeria (Adewumi, 2015). This study is carried out to evaluate the performance of *C. gariepinus* hatchlings fed baker's yeast, chicken egg yolk and milk powder as alternatives to shell-free *Artemia*.

MATERIALS AND METHODS

Study Area

The study was carried out at the hatchery room of the Aquatic Bioresources Unit, National Biotechnology Development Agency (Bioresources Development Centre) Katsina, Katsina State. Katsina lies between latitude 11° 7' and 13° 22' north and longitude 6° 52' and 9° 2' east. The hatchlings for the experiment were bred at the hatchery room of the Aquatic Bioresources unit of the Bioresources Development Centre, Katsina. The hatchlings were 4 days old at the commencement of the feeding trial.

Experimental Diets

The feeding trial involved using four different food items: shell-free *Artemia* which served as the control (T_0), baker's yeast (T_1), boiled chicken egg yolk (T_2) and full cream milk powder (T_3). The shell-free *Artemia* used for this study was obtained from feed suppliers at Katsina, while the baker's yeast, chicken egg and milk powder were all purchased from the Katsina Central Market. The shell-free *Artemia* with 54% crude protein, baker's yeast, the chicken eggs were hard boiled daily and yolk removed, and lastly was the full cream milk powder weighed each, daily ration was fed to the hatchlings all in triplicates.

Experimental Design

Each of the diets were fed to *C. gariepinus* hatchlings (n = 1,200; 0.28±0.0g) in triplicate making a total of 12 plastic hatchery tanks (semi flow - through system) i.e. (n = 100 per tank). Water quality parameters such as pH, dissolved oxygen (DO), temperature and ammonia were monitored weekly. Hatchlings were fed 6 times daily between the hours of 07:00 and 23:00 at regular interval for a period of 28 days at a fixed feeding rate of 10% body weight as recommended by Ukwe *et al.* (2018). The initial body weight of each set of hatchlings was measured using a digital weighing balance before stocking and subsequently bulk weighing of hatchlings in each tank was done after every 7 days, the growth performance parameters were computed and analyzed according to the following equations as described by Stickey *et al.* (2006) as follows;

$$Mean\ weight\ gain, MWG = final\ weight\ (g) - initial\ weight\ (g)$$

$$Daily\ weight\ gain, DWG = \{final\ weight\ (g) - initial\ weight\ (g)\}/experimental\ days$$

$$Specific\ Growth\ Rate, SGR = \{(log\ final\ weight\ (g) - log\ initial\ weight\ (g)\}/\ culture\ period\} \times 100$$

$$Feed\ Conversion\ Ratio, FCR\ (g/g) = feed\ intake\ (g)/weight\ gain\ (g)$$

$$Survival\ rate = \{(final\ no.of fish - initial\ no.of fish)/initial\ no.of\ fish\} \times 100$$

Statistical Analysis

The data obtained were subjected to one - way analysis of variance (ANOVA) using the GraphPad instant package for windows 2010 of statistical analysis system (SAS, 2010). Mean separation was done (at P = 0.05) using Fisher's least significance difference (LSD) to separate the means in cases of significant difference.

RESULTS AND DISCUSSION

The mean initial weight in all the treatments was 0.28±0.0g, while the mean final weight range from 1.18±0.15g – 1.52±0.12g. The control diet T_0 (Shell-free *Artemia*) had the highest final mean weight (g) value; 1.52±0.12 followed by T_2 (chicken egg yolk) with 1.50±0.33, T_3 (milk powder) had 1.48±0.12, while T_1 (baker's yeast) had the lowest value; 1.18±0.15. The highest daily growth rate (g/day) value; 0.054±0.05 was recorded in T_0, followed by T_2, T_3 and T_1 with 0.053±0.04, 0.052±0.06 and 0.042±0.01 respectively. The specific growth rate (%day) value; 2.62±0.11 was highest in T_0, followed by 2.60±0.14 in T_2, 2.58±0.06 in T_3 and 2.23±0.15 in T_1 respectively. The feed conversion ratio value; 0.435±0.06 was highest in T_1, followed by 0.326±0.07 in T_3, 0.321±0.09 in T_2 and 0.316±0.03 in T_0 respectively. The highest survival rate value; 78.00±1.07 was recorded in T_0, followed by T_2, T_3 and T_1 with 77.50±1.03, 51.20±1.02 and 42.80±1.06 respectively (Table 1).

Table 1: Performance of *C. gariepinus* Hatchlings Fed Different Treatment Diets

Parameters	T_0	T_1	T_2	T_3
Initial mean weight (g/fry)	0.28±0.0[a]	0.28±0.0[a]	0.28±0.0[a]	0.28±0.0[a]
Final mean weight (g/fry)	1.52±0.12[b]	1.18±0.15[a]	1.50±0.33[b]	1.48±0.12[b]
Mean weight gain (g/fry)	1.24±0.07[c]	0.90±0.04[b]	1.22±0.91[c]	1.20±0.60[c]
Daily growth rate (g/day)	0.054±0.05[b]	0.042±0.01[a]	0.053±0.04[b]	0.052±0.06[b]
Specific growth rate (%/day)	2.62±0.11[d]	2.23±0.15[c]	2.60±0.14[d]	2.58±0.06[d]
Feed conversion ratio (g/fry)	0.316±0.03[a]	0.435±0.06[b]	0.321±0.09[a]	0.326±0.07[a]
Survival rate (%)	78.00±1.07[c]	42.80±1.06[a]	77.50±1.03[c]	51.20±1.02 [b]

Mean values in each row with similar superscripts are not significantly different (p>0.05).

Keys:

T_0 - Shell-free *Artemia*

T_1 - Baker's yeast

T_2 - Boiled chicken egg yolk

T_3 - Full cream milk powder

There was no significant difference (p>0.05) in the final mean weight and mean weight gain of *C. gariepinus* hatchlings fed shell -free *Artemia* (T_0), chicken egg yolk (T_2), and milk powder (T_3) to fingerlings except for the hatchlings fed baker's yeast (T_1). There was also no significant difference (p>0.05) on the daily growth rate and specific growth rate of *C. gariepinus* hatchlings fed shell -free *Artemia* (T_0), chicken egg yolk (T_2), and milk powder (T_3) to fingerlings except for the hatchlings fed baker's yeast (T_1). Findings from this study was in agreement with the findings of Ikililu *et al.* (2012) who reported a positive growth response for *C. gariepinus* hatchlings fed different dry feeds and Adewumi (2015) for *C. gariepinus* hatchlings fed different starter diets. The poor growth performance recorded from the *C. gariepinus* hatchlings fed baker's yeast (T_1) in this study could be attributed to the texture of the baker's yeast, its digestibility and nutrient leach in water. There was no significant difference (p>0.05) in the values of the feed conversion ratio of *C. gariepinus* hatchlings fed shell -free *Artemia* (T_0), chicken egg yolk (T_2), and powdered milk (T_3) to fingerlings except for the hatchlings fed baker's yeast (T_1). The feed conversion ratio value; 0.435±0.06 was poor (highest) in the hatchlings fed baker's yeast (T_1) despite its higher crude protein value, than both chicken egg yolk (T_2), and powdered milk (T_3) respectively as reported by Ikililu *et al.* (2012) and Adewumi (2015). Findings from this study contradicted the report by Sogbesan (2023) which stated that the higher growth rates and lower (better) feed conversion ratio values were achieved with diets containing higher crude protein. According to Ikililu *et al.* (2012) the weight gain of a fish is directly proportional to the crude protein content of the diet provided the levels of protein do not exceed 50%. In order to obtain optimum growth in intensive culture, Sogbesan (2014) reported a 25% crude protein in diet as adequate for catfish hatchlings rearing. The survival rate values; 42.80±1.06 - 78.00±1.07 obtained in this study were lower than the values; 88.0±1.01 - 88.9±1.0 reported by Ali *et al.* (2023) for *C. gariepinus* fry fed dietary betaine hydrochloride, but higher than the values; 28.60 - 69.50 reported by Adewumi (2015) for *C. gariepinus* hatchlings fed different starter diets and the values; 52.0±0.00 - 62.0±0.00 reported by Noah and Ekong (2023) for *C. gariepinus* larvae fed fishmeal and a test feed. Results from this study was in agreement with the findings of Ali (2015) who reported a higher survival rate value for *C. gariepinus* fry fed Shell-free *Artemia* and Ikililu *et al.* (2012) for *C. gariepinus* hatchlings fed hen egg yolk. However, the lower survival rate values recorded from both the *C. gariepinus* hatchlings fed baker's yeast and milk powder in this study was in consistent with the findings of Ikililu *et al.* (2012) which reported lower survival rate value for *C. gariepinus* hatchlings fed baker's yeast and Adewumi (2015) which reported lower survival rate for *C. gariepinus* hatchlings fed milk powder. This could be as a result of the nutrient leach of the baker's yeast in water and also the solubility of the milk powder which quickly dissolve in water, thereby causing pollution, which could have negative effects on the survival rate of the *C. gariepinus* hatchlings.

CONCLUSION

Feeding boiled chicken egg yolk and full cream milk powder to *C. gariepinus* hatchlings as starter diets, as an as alternative to shell-free *Artemia* could be an efficient feeding strategy in promoting the growth of *C. gariepinus* hatchlings when compare to the baker's yeast. However, in terms of survival

rate feeding chicken egg yolk to *C. gariepinus* hatchlings might be a better survival strategy by reducing mortalities in *C. gariepinus* hatchlings when compare to the baker's yeast and milk powder. Since chicken egg yolk contain all the necessary nutrient for the growth of *C. gariepinus* hatchlings for the first 28 days of life, the use of boiled chicken egg yolk as alternative shell-free *Artemia* is encouraged in the culture of *C. gariepinus* hatchlings.

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