

The Effect of Light and Dark Conditions on the Feed Intake and Growth of the African Catfish (*Clarias gariepinus*, Burchell, 1822)

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Abstract: The effect of the presence or absence of light on the feed intake and growth performance of *Clarias gariepinus* fingerlings were studied. Triplicate group of ten (10) fish with an initial mean weight of 3.90g were randomly distributed into six plastic tanks containing fifty (50) liters of water. They were fed with a commercial feed for a period of seven weeks. The result obtained showed that feeding of *Clarias gariepinus* fingerlings either in dark or light conditions does not influence their growth performance as there were no significant differences ($P=0.05$) in the mean feed intake, weight increase, feed conversion ratio, specific growth rate and survival rate of fish fed under dark conditions and fish fed under light conditions.

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1. Introduction

The African catfish *Clarias gariepinus* (Burchell, 1822) is the most important farmed fish in Nigeria today. Its rapid growth at high densities, ability to breathe air and to withstand poor water quality, and its tasty flesh make *C. gariepinus* an excellent candidate for aquaculture (Appelbaum and Kamler 2000).

Rearing of the fingerlings of *C. gariepinus* is the major challenge facing the aquaculture of *C. gariepinus* (Verreth, 1994). Several biotic and abiotic factors are known to constitute "stressors" of fish in aquatic environment. These environmental conditions such as temperature, salinity, photoperiod, oxygen availability and water velocity could influence the growth of fish, as well as affect their performance (Berg *et al.*, 1992).

According to Aderolu *et al.* (2010), feeding by fishes depends on the interactions between the fish and its environment including stock density, time, day length, season, etc. Study has shown that fingerlings of *C. gariepinus* reared in continuous darkness show a better growth rate than those reared in continuous light or normal photoperiod. Leading to the suggestion that restriction of light may be used in *C. gariepinus* culture for enhancement of growth (Appelbaum and Kamler 2000).

Fish can be classified into species that rely predominantly on vision, and those that rely more on chemical, tactile or electrical senses (Appelbaum and Kamler 2000). The feeding of *C. gariepinus* is dependent on sensory organs other than the visual senses (Mukai and Lim, 2011).

This study aims to determine if there exists any difference in the rate of feed intake of *C.*

gariepinus fingerlings fed under dark and light conditions and also determine the effect of this on the growth performance of *Clarias gariepinus* fingerlings.

2. Materials and Methods

2.1 Area of Study

The study was conducted at the zoological garden of the Department of Biological Sciences of the University of Abuja, located in Gwagwalada Area Council, Abuja. Gwagwalada is about 55 kilometers from the Federal Capital City of Nigeria and is located between Lat. $8^{\circ}55'$ and $9^{\circ}00'N$ and Longitude $7^{\circ}00'$ and $7^{\circ}05'E$. There are two seasons (the dry and wet season) yearly. The dry season starts in October and ends in March while the wet season is from April to September with a mean total rainfall of approximately 1,650mm per annum. The temperature of the area ranges from $30^{\circ}C$ to $37^{\circ}C$ yearly with the highest temperature recorded in the month of March (Balogun, 2001).

2.2 Experimental Procedure

Sixty (60) African catfish *C. gariepinus* fingerlings with average weight of 3.9 g were obtained from a local hatchery in Kuje Local Government Area, FCT Abuja and transported to the experimental unit in aerated polyethylene bags.

Fish were acclimatized to laboratory conditions for one week and ten fingerlings were randomly distributed into six plastic tanks containing 50L of water. Fish were kept under natural photoperiod of approximately 12/12 hours light/dark cycle and the experiment carried out in triplicates. Three tanks were kept in a room that had blinds that

were covered during feeding so that feeding was done in the dark while the other three tanks were left outside and feeding done under normal photoperiod. They were fed the Coppens fish feed (2mm) for 48 days from the month of August to October, 2012. Feeding was done daily at (8.00-9.00am) and (5.00-6.00pm).

2.3 Data Collection and Analysis

Data on fish growth characteristics were recorded weekly. Feed conversion ratio, specific growth rate and mortality were determined as follows:

(i) Specific growth rate (SGR) (g/day) =
$$\frac{(\text{Loge } W2 - \text{Loge } W1) \times 100}{T2 - T1}$$

Where:

W2 = Weight of fish at time T2 (final)
 W1 = Weight of fish at time T1 (initial)

(ii) Feed conversion ratio (FCR) =
$$\frac{\text{Total feed consumed by fish (g)}}{\text{Weight gain by fish (g)}}$$

(iii) Percentage Survival Rate =
$$\frac{(N_o - N_t)}{N_o} \times 100 \%$$

Where:

No = Number at the start of the experiment
 Nt = Number at the end of the experiment

2.4 Statistical Analysis

The results were presented as mean ± standard Deviation. Data were subjected to t-test analysis (P<0.05).

3. Result

The mean feed intake of the fingerlings of *Clarias gariepinus* fed in light and dark conditions for the seven weeks were 162±0.30g and 176.70±5.30g respectively. Furthermore, the initial and final mean weight of the fingerlings fed under dark condition for a seven weeks were 5.70±0.30g and 31.0±2.5g respectively while initial and final mean weight of the fingerlings fed under light condition for a seven weeks were 5.10±0.30g to 28.70±1.50g respectively. However, the mean FCR of the fingerlings fed under light and dark condition for the seven weeks were 0.97±0.07 and 0.98±0.10 respectively. The mean SGR of the fingerlings fed under light and dark conditions were 3.28± 0.20g/day and 3.32±0.10g/day respectively. The mean percentage survival rate of the fingerlings fed under the dark and light conditions for seven weeks were 90%

The growth performances of the fingerlings for a period of 7 weeks are presented in Table 1.

Table 1: Mean growth data of juvenile *C. gariepinus* in the light and dark conditions

Parameter	Light	Dark
Mean Feed Intake (g)	162±0.30	176.70±5.30
Initial weight (g)	5.10±0.30	5.70±0.40
Final weight (g)	28.70±1.50	31.10±2.50
Mean FCR	0.97±0.07	0.98±0.10
Mean SGR (g/day)	3.28±0.20	3.65±0.10
Survival Rate (%)	90	90

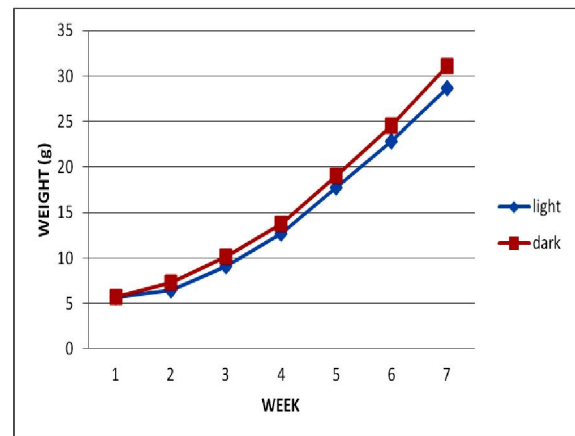
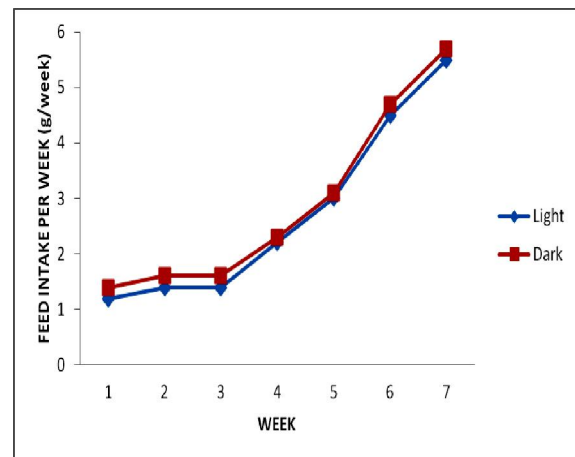


Figure 2: Comparative mean weight of the fingerlings of *Clarias gariepinus* fed under light and dark conditions for seven weeks

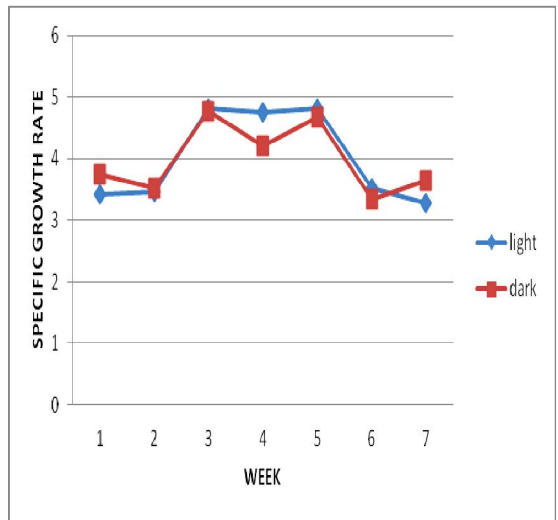
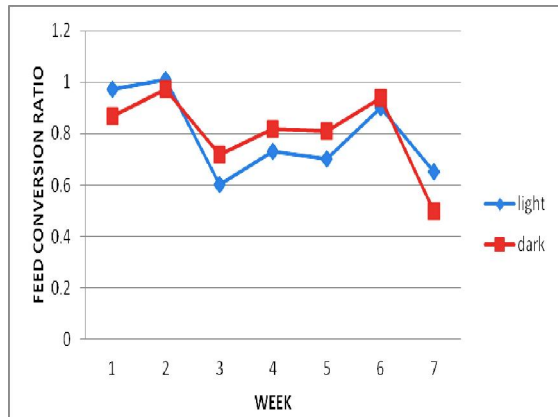


Figure 4: Comparative mean specific growth of the fingerlings of *Clarias gariepinus* fed under light and dark conditions for seven weeks

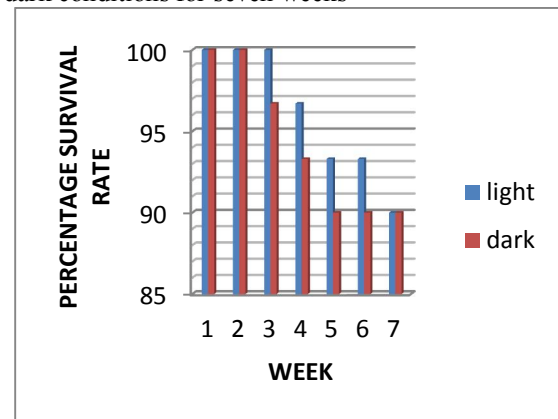


Figure 5: Comparative mean percentage survival rate of the fingerlings of *Clarias gariepinus* fed under light and dark conditions for seven weeks.

4. Discussion

The mean feed intake of fingerlings fed under dark conditions was slightly higher than feed intake of fingerlings fed under light conditions (see Figure 1). Although this difference was not significant ($P=0.05$). This is in agreement with Mukai and Lim (2011) who found that ingestion rates under light versus dark conditions did not vary significantly. This may be due to the ingestion rate of the African catfish being dependent on chemo-sensory senses rather than visual or mechanical senses (Mukai and Lim, 2011). Mustapha *et al.*, (2012) showed that fingerlings cultured in dark conditions exhibited higher growth rate and increased body weight but these were attributed to better food conversion efficiency, suppression of swimming activity, aggression and stress in dark rather than an increased feeding rate. It has been suggested that the increased growth rate of *C. gariepinus* reared under dark conditions may be the result of energy that would have been expended on the above activities being invested in body growth (Appelbaum and Kamler, 2000; Mustapha *et al.*, 2012).

The final mean weight of the fingerlings of *C. gariepinus* fed under dark conditions were slightly higher than the final mean weight of the fingerlings fed in the light condition although these differences were not significant ($P=0.05$).

Fish fed under dark and light condition had almost the same mean feed conversion ratio. No significant difference ($P=0.05$) was found in the SGR for the fingerlings fed both in the light and dark conditions. The percentage survival rate of the fingerlings fed under light and dark conditions were the same.

In conclusion, in the early life of *C. gariepinus*, feeding in either dark or light conditions does not necessarily increase the feeding rate and growth performance.

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