GROWTH PERFORMANCE AND SURVIVAL OF *CLARIAS GARIEPINUS* FINGERLINGS REARED IN PLASTIC BASINS AND CAGES

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PRIRAST I PREŽIVLJAVANJE MLAĐI *CLARIAS GARIEPINUS* U PLASTIČNIM BAZENIMA I KAVEZIMA

Abstrakt

Rast i preživljavanje mlađi *Clarias gariepinus* je ispitivana pod dva uslova sredine; u plastičnim bazenima i kavezima potopljenim u zemljane bazene.

Mlađ je hranjena u količini od 5% telesne težine. Nakon 8 nedelja (56 dana) određivane su jednom nedeljno masa i dužina. Krajnja srednja masa za plastične bazene i kaveze bila je 11,41 g i 17,63 g. Srednja ukupna dužina je bila za kaveze 13,53 cm a za plastične bazene 10,89 cm. Preživljavanje je bilo veće u kavezima (82%) nego u plastičnim bazenima (24%). Rast ribe procenjivan je u dva uslova sredine, ustanovljena je značajna razlika ($p < 0,005$) u porastu srednje mase i srednje dužine. Prema prirastu riba, rezultati ispitivanja govore da mlađ gajena u kavezima pokazuje bolji prirast i preživljavanje za mlađ afričkog soma *Clarias gariepinus.*

Ključne reči: *Clarias gariepinus, mlađ, plastični bazeni, kavezi*

INTRODUCTION

The goal of any aquaculture programme should be to adopt methods that will produce quality fingerlings which can survive better, grow faster and resist some routine or common disease and adverse environmental conditions.

Since the 1970s the African catfish *Clarias gariepinus* has been considered to be a fish of great promise for fish farming in Africa. Its growth rate is high; it is very resistant

and appreciated in a wide number of African countries. The development of a reliable method for the production of *Clarias gariepinus* fingerlings is one of the priorities of agriculture research in Africa (Anonymous, 1987). *Clarias gariepinus* which is widely considered to be one of the most tropical catfish species for aquaculture has an almost Pan-African distribution, from the Nile to West Africa and from Algeria to Southern Africa. They occur in minor-Asia (Israel, Syria and South of Turkey) (FAO, 2003). In general *Clarias gariepinus* lives in most river basins.

There is a steady rise in human population in Nigeria and this has not been matched by corresponding increase in food production (Ekokotu and Ekelemu, 1999) while human population growth is rising at a rate of about 4-5% and live stock production is trailing behind at a rate of 2-3%. This shows that there is a wide gap between supply and demand of animal protein. As human population increase and natural fisheries resources diminish, knowing how to fish is not enough for today's fishers and their families, many would be better off learning how to culture fish (Meryl, 1996).

The consequence of the sceneries is the soaring cost of animal protein needs. This has made it almost impossible for the poverty stricken Nigerians to meet their animal protein needs. Thus, the need arises to explore alternative avenues for accessing animal protein as a way of increasing protein consumption. This alternative source could be achieved if farmers could adopt better agriculture or fish culture methods.

This study present an analysis on growth response and survival of fingerlings of *Clarias gariepinus* reared in cages suspended in an earthen pond and plastic basins. The objective of this study is to determine the growth performance and survival of *Clarias gariepinus* fingerlings reared in plastic basins and cages suspended in an earthen pond.

MATERIALS AND METHODS

Experimental Site

The research project was carried out at the Teaching and Research Fish Ponds of The Department of Environmental Biology and Fisheries Adekunle Ajasin University Akungba Akoko, Nigeria.

Experimental Set Up

A total of one hundred (100) fingerlings of *Clarias gariepinus* were procured from Sunshine Fishery Alagbaka, Akure, Ondo State, Nigeria.

The initial average weight of the fish ranges from 0.643 g to 0.644 g. The fingerlings were randomly distributed into two plastic basins (25 fish per basin) and two cages (25 fish per cage).

The fingerlings were fed twice daily at 5% of total body weight with floating feed (copens). The experiment was carried out for a period of eight 8 weeks. (56days).

Maintenance of Fingerlings

The fingerlings were stocked in two replicated plastic basins A and B (25 per plastic basin) kept and reared in the hatchery (Picture 1, protected indoor rearing) and two replicated cages A and B (25 fingerlings per cage) suspended and reared in an earthen pond (Picture 2, protected outdoor rearing). The sizes of the plastic basin each is 2 x 1 x 1 m

and the cages 2 x 1 x 1 m.

The plastic basins were filled to 2/3 of its depth and the cages were also suspended at the edge of the pond to the 2/3 of its depth. The fingerlings were fed twice daily in each plastic basin and cage with commercial feed (copens feed).

The left over feed was siphoned out of the base of each plastic basin and water was also replaced daily. As the water level reduced in earthen pond the cage were relocated to maintain their normal level of water.

Monitoring of Physico-chemical Parameters

Physico-chemical parameters like temperature and pH were monitored on a daily basis according to the methods of Boyd 1981 using pH meter and thermometer (Surgifield medical England SM-602 1A).

Data Collection

Weight and length measurements (standard and total length) were recorded weekly. The fingerlings were weighed to the nearest 0.1 g with an electronic weighing balance (Sartorius excellence scale). The standard and total lengths were measured to 0.1 cm using a standard metric ruler.

Growth and Survival Parameters

To determine growth response, fingerlings in each plastic basins and cages were weighed and measured weekly and readings obtained were used to compute parameters such as SGR (specific growth rate), DGR (daily growth rate), MWOF (mean weight of fish) MGW(mean weight gain) and Survival rate. The above parameters were calculated to determine the effect of the environment on the growth performance and survival of *Clarias gariepinus* fingerlings reared in plastic basins and cages suspended in an earthen pond.

Definition of the terms

Specific Growth Rate (SGR)

$$SGR = \frac{\text{Loge } Wf - \text{Loge } Wi \times 100}{\text{Time (days)}}$$

Where

Wf = final average weight at the end of experiment
Wi = Initial average weight at the beginning of experiment
Loge = natural logarithm reading
Time = number of days for experiment

Mean weight of fish (MWF)

$$MWF = \frac{\text{Total weight of Fish}}{\text{Number of Fish}}$$

Daily growth rate (DGR)

$$DGR = \frac{\text{mean increase in weight per day}}{\text{Body weight}}$$

Mean weight gain (MWG)

$$MWG = Wt2 - Wt1$$

Where Wt1 = initial mean weight of fish at time T1

Wt2 = final mean weight of fish at time T2

$$\text{Survival rate (\%)} = \frac{\text{No of fish that survived} \times 100}{\text{Total no of fish Stocked}}$$

Statistical analysis

The data obtained were subjected to both descriptive and inferential statistics. T-test was then used to determine the significant difference in the environmental effect on fish growth rate and survival.

RESULTS

Table 1 shows the summary of the initial mean weight (g) and final mean weights (g) of fish, initial mean length and final mean length (cm), SGR (specific growth rate), DGR (daily growth rate) and survival rate at the end of experiment.

The percentage survival rate of fish in plastic basins and cages at the end of experiment were presented in Table 1. The survival rate was (24%) in plastic basins while the highest survival rate was recorded in cages (82%). The initial mean weight in plastic basin and cage are 0.64g ± 0.22. The final mean weight in cages 17.63g ± 6.12 was higher than that of plastic basins 11.41g ± 7.56. The plastic basins has a total number of 12 survived fish out of 50 stocked fingerlings while the cages has a total number of 41 survived fish out of 50 stocked fingerlings at the beginning of the experiment. Initial and final mean lengths recorded in cage are 2.55 cm ± 0.32 and 13.53 cm ± 1.63 while that of plastic basin were 2.55 cm ± 0.32 and 10.89 cm ± 2.69 respectively. Daily growth rate in plastic basin was 0.19 g and in cage as 0.30 g.

Table 1: Summary of growth performance of *Clarias gariepinus* fingerlings in plastic basin and cages

Parameters	Plastic Basin	Cage
Initial mean weight(g)	0.64 ± 0.22	0.64 ± 0.22
Final mean weight(g)	11.41 ± 7.56	17.63 ± 6.12
Initial mean length(cm)	2.55 ± 0.32	2.55 ± 0.32
Final mean length(cm)	10.89 ± 2.69	13.53 ± 1.63
SGR % day $^{-1}$	5.14	5.92
DGR (g)	0.19	0.30
Survival rate %	24	82

Table 2: Means and ranges of physicochemical parameters of water in plastic basins and cages for rearing *Clarias gariepinus* fingerlings

Parameter /week	pH Plastic basin	pH Cage	Temperature (^{0}C) Plastic Basin	Temperature (^{0}C) Cage
Wk 1	7.28 (6.90-7.80)	8.02 (7.30-8.50)	26.30 (25.10-27.50)	28.66 (27.20-30.20)
Wk 2	7.17 (7.10-7.60)	7.48 (7.20-8.50)	26.76 (25.20-28.70)	27.88 (25.30-30.10)
Wk 3	7.27 (6.70-7.80)	7.94 (7.10-8.50)	26.79 (25.20-29.20)	27.68 (26.20-28.70)
Wk 4	7.68 (7.30 7.80)	8.49 (7.90-8.70)	27.27 (24.20-29.20)	28.11 (25.20-31.80)
Wk 5	7.31 (7.10-7.60)	8.19 (7.80-8.50)	26.82 (25.2-28.1)	28.43 (27.2-30.00)
Wk 6	7.30 (7.10-7.70)	8.27 (8.00-8.60)	26.77 (25.50-28.60)	28.40 (27.20-30.10)
Wk 7	7.31(7.20-770)	8.33 (8.00-8.70)	26.42 (25.00-28.60)	28.40 (27.20-30.10)
Wk 8	7.35 (7.10-7.60)	8.38 (7.90-8.70)	26.83 (25.70-28.70)	28.46 (27.40-30.10)

Figures I and II showed the weight gain per week and survival rates per week for a period of 8 weeks. The means and ranges of physicochemical parameters of water inside plastic basin and cages for 8 weeks were shown in Table 2.

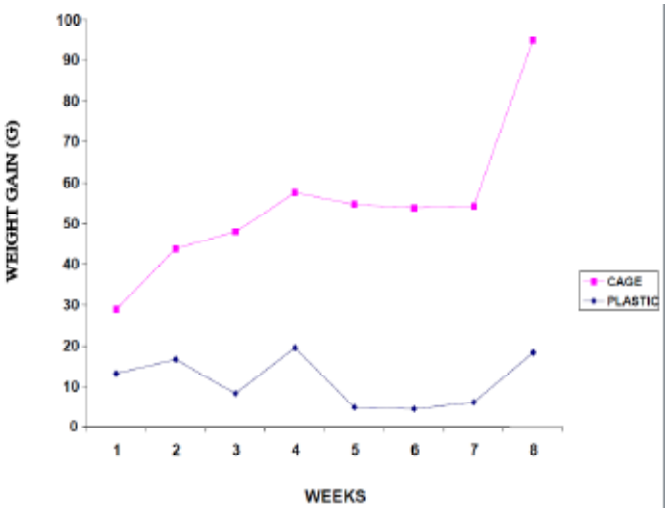

Figure 1. Weekly weight gain of *Clarias gariepinus* fingerlings in plastic basin and cages.

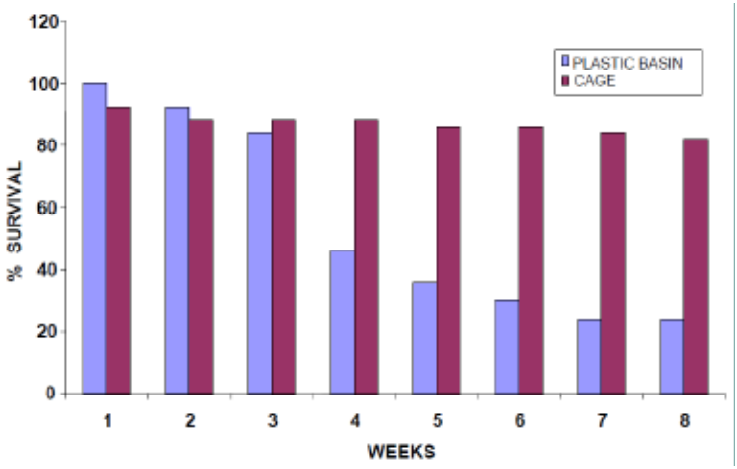

Figure 2. Percentage survival of *Clarias gariepinus* fingerlings in plastic basin and cage.

DISCUSSION

The growth response and survival of fingerlings in cages is clearly visible, compared to plastic basins. The cage had the highest survival rate of 82% which was comparable with survival for Tilapia (99%) cultured in cages by Alev and Dikel (2003) in Seyham Dam Lake. The results of this study indicate the survival ability of fingerlings reared in plastic basin and cages. The mortality rate was high in plastic basin (76%). This could be as a result of stress due to handling at short intervals which led to infection thus causing high mortality rate. It is an established fact that continuous stress affects the normal behaviour and development of fish with reduction in growth (Jobling and Reinsens, 1986) and increase in susceptibility to infection through immune-depression (Shreck, 1996). This may lead to mortality (Ajani *et al.,* 2006) as observed in plastic basins from 4-7th week in figure 2. The mortality in cage was very low (18%) and this could be attributed to the immunity derived from natural environment and less stress. The fingerlings in plastic basins had access to only to the supplementary feed given to them, while those of cages derives additional nutrient from the environment apart from the supplementary feed. This helps in the increase in growth performance of the fingerlings in the cage. Fingerlings size variations are common phenomenon during African catfish harvest in pond (Nwadukwe, 1995). This variation is known to be mainly as a result of both genetic and environmental factor (Nwadukwe, 1995). These could be the reasons for growth variation observed during this study. The recorded mean values of all the physico-chemical parameters in this study were within the acceptable range for fish growth and health (Boyd, 1979; Mazik *et al.,* 1991). Survival rate of *C. gariepinus* fingerlings in cages in this present study was higher than the range reported by Wesbster *et al.,* 2001 for juveline Sunshine bass, *Merone chrysops X M.saxotifilis* which had survival rate between 62 -75% raised in cages.

Based on the growth performance and survival rate of *Clarias gariepinus* fingerlings in this study, it is therefore suggested that rearing of *C.gariepinus* in cages is better than in plastic basins.

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