ASSESSMENT OF GROWTH PERFORMANCE OF CLARIAS GARIEPINUS FINGERLINGS FROM TWO CULTURE SYESEMS

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ABSTRACT
Assessment of growth performance of *Clarias gariepinus* fingerlings from two culture media was conducted at the Federal College of Agriculture, Ishiagu Ebonyi State Nigeria fish farm between October 2013 and January, 2014. Five concrete tanks, each 11.31m^2 and a stagnant earthen pond 36m^2 were each stocked with *Clarias gariepinus* fingerlings mean weight 7.29 $\pm$ 0.22g at 20fish/m^2 that is, 270 and 720 fish for concrete tank and earthen pond respectively. The fish were fed at 5% body weight for 91 days with pelleted floating commercial fish feed. Water in concrete tanks was changed two times per week while that in earthen pond was topped at intervals. The water parameters were monitored and test carried out with water diagnostic kits at the beginning and randomly during the production to determine the quality of the water. The results of the growth parameters were significant ($P<0.05$). Results from earthen pond significantly differed from concrete tanks. There was a 48.12% improvement in the earthen pond over the least mean weight gain from tank 2. Tank 3 significantly differed from that of the earthen pond in the daily mean weight gain. The gross profit margin per fish was =N=100.07 in the earthen pond when compared with the lower profit margin in concrete tank 5 with =N=1.40. The use of earthen pond in the culture of *Clarias gariepinus* where ever soil is not a hindrance (since it looks like the fish natural environment) is therefore recommended.

Keywords: Growth, Clarias gariepinus and culture systems

INTRODUCTION
Fish supplies over 50% of the total animal protein consumed in developing countries but less in developed ones (FAO, 1998). These supplies are from artisanal, aquaculture and the industrial sector. Fish protein provides a good combination of amino acids which is highly suited to man's nutritional requirements and compares favourably with that provided by meat, milk and eggs. Catfish can be raised in high densities resulting in high yield (6 – 16 tons ha^{-1} year^{-1}), (Okechi, 2004). Ponds have carrying capacities and this also depends on the type of system employed, (Marzolf, 2003).These include earthen ponds 10 – 40 fingerlings or juveniles/m^2; flow through system, 100 fingerlings or juveniles/m^2 or re-circulatory system, 350 fingerlings or juveniles/m^2. Any attempt to hold beyond this may result in overcrowding which will result in competition and its attendant adverse effects. Feeding twice daily, if possible, will usually improve food consumption and feed conversion, (MCES, 2014). Optimum pH for fish culture ranged from 6.5 to 9.0. Nitrite concentrations as low as 0.5ppm can cause problems in fish culture (MCES, 2014).

Catfish grow differentially as a result of varied genetic quality of the fish species (Adewole *et al*., 2008). Fish starts to have their varied genetic quality from egg stage, from different egg sizes, through hatchling till maturity into adulthood. Therefore, the differential growth pattern becomes evident once fish is stocked. These phenomenon, which causes the emergence of oversized fish (shooters) among their peers predispose fish stock to cannibalism. This situation can thus be well managed through sorting every forth-night for the first two months. Adebayo and Adesoji (2008) observed a considerable weight gain in the earthen pond but the percentage survival lower than in concrete tanks. They concluded that earthen pond, though a confined enclosure like the concrete tank, mimic nature and this may be responsible for its high yield in terms of fish size.

Nguyen and Yang (2014) recorded daily mean weight gain of hybrid catfish 1.7 – 1.9g/fish/day, higher than in wastewater recycling tanks of 1.1- 1.7g, or in an integrated cage - cum - pond system 0.65g/fish/day or integrated cage cum tank 0.8 – 0.9g/fish/day lower than in an integrated pen – cum – pond system 2.5 – 2.6g/fish/day and in integrated cage – cum – pond system 2.1 - 2. 2g/fish/day. The study was therefore designed to evaluate the effect of culture media on the growth performance of *Clarias gariepinus* fingerlings within Ishiagu environment.

MATERIALS AND METHODS

Clarias gariepinus fingerlings with mean weight 7.29 $\pm$ used in the experiment were bred in the Department of Fisheries' fish farm, Federal College of Agriculture, Ishiagu Ebonyi State and stocked at 20fish/m^2 in the two culture media. Five concrete tanks, each measuring 5.80m by 1.95m (11.31m^2) and one earthen pond measuring 6m by 6m, (36m^2) were used. A commercial brand of feed was used at 5% fish body weight in feeding the fish at 08.30 hour and 16.30 hour daily. The culture water was replaced twice weekly in the concrete tanks while that in the earthen pond was topped whenever the need arose. The water parameters were monitored at the beginning of the experiment and test carried out at random to determine the suitability of the culture water using water test kit. The analysis was done as described by complete outfit for fresh water analysis request kit, 'pond lab' produced by NT laboratories ltd, UK. Three fish samples were collected from each tank and earthen pond biweekly to determine fish growth and the data collected used to calculate the feed required at 5% fish body weight. Fish mortality was determined by watching out for dead fish daily and equally by subtracting the total number of fish at the end of experimentation from the initial stock. Growth parameters were recorded and the derived values calculated. At the end of 91 days experimentation, data obtained were subjected to one way analysis of variance (ANOVA), using SPSS 17.0 statistical software package at 5% alpha level while means were separated using Student – Newman Kuel (SNK). The expenditure, income and grow margin of the were equally computed.

RESULTS AND DISCUSSION

The results of the comparative growth of *Clarias gariepinus* is shown in Table 1. Fish final weight ranged from 139.86 $\pm$ 7.59 in tank 2 to 258.23 $\pm$ 8.02 in the earthen pond. The final fish weight from the earthen pond significantly differed from the concrete fish tanks at 5% level, ($P<0.05$). The mean weight gain followed the same trend as in the final fish weight. There was a 48.12% improvement in the earthen pond over the least mean weight from tank 2. The result was also significant, ($P < 0.05$). Result from daily mean weight gain ranged from the least, 1.47 $\pm$ 0.09 in tank 2 to the highest, 2.84 $\pm$ 0.09 in the earthen pond. The daily mean weight gain of tanks 2 and 5 significantly differed from tank 4 while tank 1 did differ from neither tanks 2 and 5 nor tank 4. Tank 3 significantly differed from that of the earthen pond. This result corresponds with that reported by Adebayo and Adesoji (2008), and Nguyen and Yang (2014). Adewole *et al* (2008) reported similar increase in the growth of fish cultured in earthen ponds as observed in this work but the high mortality recorded in the same earthen ponds was not noticed in this work. Rather, higher mortality was recorded in the concrete tanks. The feed conversion ratio ranged from the least in the earthen pond with 0.05 $\pm$ 0.03 to the highest in tank 5 with 0.70 $\pm$ 0.00, this was equally significant, ($P < 0.05$) indicating that fish raised in earthen pond consumed less feed but put on more weight than those in concrete tanks. The data on specific growth rate indicated that earthen pond had the highest value of 3.82 $\pm$ 0.06, followed by tank 3 with 3.63 $\pm$ 0.08 while the least was from tank 5 with 3.21 $\pm$ 0.06.

Table 1: Growth parameters of *Clarias gariepinus* used in the experiment

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5	Earthen pond
Initial fish weight	6.63 ±0.45	6.55 ±0.30	7.47±0.47	7.03±0.73	7.82±0.42	8.23±0.20
Final fish weight	162.11 14.57a	139.86 7.59a	201.89 2.60b	165.79 11.38ab	144.70 4.16a	266.47±7.84
Mean weight gain	55.47±14.19a	133.98±8.43a	194.43±2.87b	158.72±10.93a	136.88±3.97a	258.23±8.02c
Mean weight gain/day	1.84±0.04ab	1.47±0.09a	2.14±0.03c	1.75±0.12b	1.51±0.43a	2.84±0.09
Feed conversion ratio	0.62±0.05ab	0.61±0.20ab	0.54±0.052a	0.67±0.01ab	0.70±0.02b	0.05±0.02a
Specific growth rate	3.51±0.05ab	3.37±0.11ab	3.63±0.08bc	3.49±0.08ab	3.21±0.06a	3.82±0.06c
Mortality	29.00±1.73c	21.00±3.21b	20.00±2.65b	12.67±2.03b	16.33±2.03	0.00±0.00a

There was no recorded observation of fish mortality in the earthen pond but the highest mortality was recorded in tank 1 with 29.00 $\pm$ 1.73. The physico-chemical parameters in the two culture systems are presented in Table 2. There was no marked variation in the two enclosures as all the tested parameters fell within the accepted range for aquaculture (Adeniyi, 1997). The water parameters during the production cycle did not deteriorate below the threshold. This was managed in order not to affect the production. Despite the frequencies of water exchange in the concrete tanks, the yield of fish was not proportional to the cost when compared with the earthen pond where water was not exchanged but rather topped due to evaporation.

Table 2: Water quality parameters of Ivo water used in the culture of *Clarias gariepinus* fingerlings

	Initial water quality	During rearing in tanks	During rearing in pond
pH	7.0	7.5	8.0
Ammonium	0.5mg/l	2.0mg/l	1.0mg/l
Nitrite	0.0mg/l	0.0mg/l	0.25mg/l
Nitrate	0.0mg/l	0.0mg/l	0.25mg/l
General hardness	17.8ppm	53.4ppm	106.8ppm
Alkalinity	106.8ppm	113.5ppm	356ppm
Water temperature	25.3^0C	25^0C	28^0C
Dissolved oxygen	6.8mg/l	3.7mg/l	5.2mg/l

The cost of fish feed in the five concrete tanks were between =N=23.91 and =N=30.44 when compared with =N=44.79 in the earthen pond (Table 3). The highest cost of fish feed in the earthen pond showed that the fish were relatively bigger in size with a resultant higher feed intake that attracted more cost. The cost of water supplied in each of the concrete tank was =N=44.45 which was higher than =N=16.67 in the earthen pond (Table 3). Earthen pond naturally absorbs wastes from the culture water, (Perschbacher and Kirk, 1991). This allows little or no water change. This condition cannot be operated in the concrete tanks as the easiest way to manage the water is by a regular water change and this incurred more cost on the total expenditure. The total expenditure was lowest in the earthen pond, =N=86.46 per fish while the highest was in concrete tank 5 valued at =N=99.89 per fish. The gross profit margin per fish was =N=100.07 in the earthen pond when compared with the lower profit margin in the concrete tanks where tank 3 had =N=43.84 while tanks 4, 1, 2, and 5 had =N=17.13, =N=6.90, =N=4.54 and =N=1.40 respectively. The yields in the five concrete tanks were almost the same from 139.86g in tank 2 to 201.89g in tank 3. These were lower to what was obtained in the earthen pond with 266g. Ajao (2011) observed that higher yield was obtained in earthen pond than in the concrete tank.

Table 3: Expenditure, income and profit margin (in naira) of *Clarias gariepinus* fish in two culture systems

CONCRETE TANKS	1	2	3	4	5	Earthen pond
Cost of production (=N=)	25.00	25.00	25.00	25.00	25.00	25.00
Cost of fish feed (=N=)	27.13	23.91	28.03	29.47	30.44	44.79
Cost of water supplied (=N=)	44.45	44.45	44.45	44.45	44.45	16.67
Final fish weight (g)	162.11	139.86	201.89	165.79	144.70	266.47
Price of fish/kg (=N=700)	113.48	97.90	141.32	116.05	101.29	186.53
Total expenditure (=N=)	96.58	93.36	97.48	98.92	99.89	86.46
Gross income (=N=)	113.48	97.90	141.32	116.05	101.29	186.53
Profit (gross margin (=N=)	16.90	4.54	43.84	17.13	1.40	100.07

CONCLUSION

The result of this work shows that whenever there is a choice between the establishment of earthen ponds and concrete tanks, and the soil is readily available, it is recommended to use earthen ponds because of the observed benefits in the culture of *Clarias* fish between the earthen pond which naturally absorbs and purifies wastes and the concrete tanks that can be best managed by routinely changing of the culture water. The use of earthen pond in the culture of *Clarias gariepinus* is therefore recommended wherever soil is not a hindrance.

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