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THE GROWTH PERFORMANCE AND SURVIVAL OF *Clarias gariepinus* FRY RAISED IN HOMESTEAD CONCRETE TANKS

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ABSTRACT

Fertilizer application in earthen ponds has been used as a low-cost method of sustainable aquaculture production. This study was carried out to investigate the growth response of African Catfish fry Clarias gariepinus (Burchell, 1882) in three different culture media in Homestead concrete tanks.

The water in the control (T_1) was not treated while T_2 and T_3 were treated with poultry droppings and soy bean milk filtrate respectively. Nine hundred (900) catfish fry weighing averagely 0.67 – 0.69g were randomly allocated per treatment. In each tank (2m x 3m x 1.5m) were suspended (3) net cages each (1m x 1m x 1m). Each net cage had 100 fry. The fish in tank 1 (control treatment) were fed fish meal from the start at 5% of their body weight four times daily while the other treatments were not fed at all for the first 7 days. Feeding with fishmeal commenced for treatments T_2 and T_3 on the next 8 – 14 day. The weights of the feed were adjusted after weekly weighing Analyses of the culture media for phytoplankton composition and water quality parameters were done for all treatments at the end of the experiment. Tables 3 and 4. The culture media with poultry manure (T_2) and soyabean filtrate (T_3) were found to influence the quality and quantity of the plankton which in turn determined the growth and survival. Tables 1 and 2. However, the best weight increase was recorded in T_1 (2.33g) followed by T_3 (1.89g) and then T_2 (1.81g) had the lowest weight gain. The survival rates in all the treatments were high but was highest in T_3 (98%) followed by T_2 (97%) and T_1 (95%).

Dissolved oxygen, pH and temperature of culture media were variously affected by the treatments. The presence of zooplanktons (Rotifer and Daphnia species) invariably supported the highest survival (98%) of the fry in treatment T_3. Treatment T_3 (11.56 ± 1.14) x 10^3) generated higher concentrations of most of identified zooplanktons than treatments T_1 (5.39 ± 0.73) x 10^3) and T_2 (12.78 ± 0.98) x 10^3). These zooplanktons were absent in treatments T_1 and T_2.

The result indicated that fertilizing the culture medium using soybean milk filtrate or poultry droppings improved the growth and of C. gariepinus.

Keywords: Non-Conventional, Culture-media, Growth/survival, *Clarias gariepinus*, Homestead Concrete tanks.

INTRODUCTION

Fertilizer application is considered a viable low cost method of sustainable aquaculture production. The success of any aquaculture venture will depend greatly on the quality of the medium in which the fish is raised, e.g. the concentration of natural and life micro-organism which constitute the first feed for the fry. Hence, the culture of natural food organisms in the medium which fish is raised becomes imperative if viable quantity of fingerlings is to be produced at minimum cost.

In tropical Africa and in Nigeria in particular the use of Artemia increases the cost of fingerling production (Omitoyin, 1999). Natural live food organisms occupy aquatic and semi-aquatic media habitats. They range from minute zoo and phytoplankton to insect larvae Adeniji *et al*. (1986); Ovie (1986). They have the advantages of assured freshness, supply of high quality proteins, and provision of vitamins, they can be produced in large quantities with predictable quality using manures, which are relatively cheap.

C. gariepinus is widely cultivated in Nigeria Olukunle (1996), Omitoyin (2007). The fish is omnivorous and can thus feed on both zoo and phytoplanktons Moses (1983). The manures used to fertilize the water (medium) in order to generate plankton are relatively cheap except for transportation cost. Poultry waste can be obtained free while soybean is cheaper than fishmeal. It is readily available in the local market. The use of homestead concrete tanks is fast becoming well known and should be encouraged for home bred fish in Nigeria, Olukunle, (1996).

Hence, it is therefore relevant to investigate the growth performance and survival of *C. gariepinus* fry raised in different culture media, with the aim of recommending the best to our local fish farmers reducing cost and boosting fingerling production.

MATERIALS AND METHODS

Rearing Tanks

3 concrete tanks with dimension 3.0m x 2.0m x 1.5m each were used. The tanks were impounded with water. 3 net cages of 1.0 x 1.0 x 1.0m^3 were suspended in each of the tanks. The net cages were anchored to the sides of the tanks and weighted down with heavy stones inserted in the pockets made at the lower corners of the net cages. This is to prevent drifting. Zippers were sewn at the top edges of the net cages to facilitate feeding and protection of the fingerlings from predation.

Each rearing tank was impounded with 6.0m^3 of water. Tanks 2 and 3 were fertilized with poultry waste and soybean milk filtrate respectively to enhance plankton production. Tank 1 was not fertilized and it served as the control.

Media Preparation: The poultry waste was collected from the University Teaching and Research Farm while the soybean was purchased from the local market both in Ibadan, Nigeria.

420g of poultry waste was weighed, stuffed in a jute bag and dropped into Tank 2. The recommended application followed the dosage of 60kg/10,000m^2 kg of soyabean, was weighed, soaked in water for 6 hours, and ground to a paste using 15 litres of water Adekoya *et al*. (2004). The resulting milk was filtered and the filtrate distributed evenly into the water in Tank 3. Tank 1 (Control) was impounded with water from the mains and no fertilizer was added.

Experimental Fish

900 hatchery-bred advanced fry (3 weeks) old of *Clarias gariepinus*, mean weight 0.67 – 0.97g were randomly distributed into the net cages (Table 1). 300 fry per treatment with 100 fry/net cage. Each cage served as replicate. The experiment lasted 3 weeks.

Experimental Feeding Trials

Feeding of the experimental fish started the following day after stocking. Fish in Tank 1 were fed 5% body weight of fish meal (72% CP). Fish in Tanks 2 and 3 were allowed to graze on the generated natural micro-organisms for one week. No fishmeal was given.

Feeding of fry in tanks (2 and 3) with fishmeal commenced in the 2nd week till the end of the experiment. The fish were fed 4 times per day. The initial and final weight of the fish per cage were taken using an electronic digital scale, SK 1000 to determine the weight gained over the experimental period (Table 1).

Water was allowed to flow freely in and out of the system at a minimum of 1 litre/min. Water samples were collected from the control and from each of the treatments at the end of the experiment. Table 4.0 shows the water quality parameters monitored which include dissolved oxygen, temperature, pH. Plankton abundance was estimated from 0.1ml sub-sample using the electronic microscope and the plankton composition is as shown in Table 3e. The survival rate of the fish in each unit was counted manually and subtracted from the number of fish stocked (Table 2.0)

STATISTICAL ANALYSIS

The analysis of variance (ANOVA) was used to test for significant differences between the treatment means, Sokal and Rohlf (1995).

RESULTS AND DISCUSSION

Fertilizer treatments used in this study increased plankton abundance. This agrees with the findings of Tidwell *et al.*, (2000), Azim *et al.*, (2001), Keshavanath *et al.*, (2001) and Dharmaraj *et al.*, (2002). Treatment 1 had the highest growth while Treatment 3 recorded the highest survival rate (Table 2.0). The quantity and quality of the planktons in treatment 3 (Table 3.0) encouraged the observed parameters.

Treatment 2 (T_2), though had the highest plankton abundance (12.78 x 10^3), recorded a lower species diversity (4 zooplankters and 8 phytoplankters while Treatment 3 (T_3) had 6 zooplankters and 9 phytoplankters. The zooplankton count for T_2 (1.13 x 10^3) was equally lower than T_3 (2.73 x 10^3). Specifically, Table 3.0 shows that treatment 3 induced higher production of zooplanktons of rotifers (0.62 x 10^3), and daphnia spp (0.52 x 10^3) which are absent in treatments 1 and 2 respectively. These zooplanktons are among the most preferred food for fry (Micha 1973, Bard, 1976, Heisig, 1979, Hirata, 1979, Bamimore, 1989). Hence, the observed higher survival of fry in the T_3 (98%) as against T_2 (87%) and T_1 (97%). All the three treatments had high survival levels but the significantly lower survival of fry in treatment T_2 can probably be ascribed to the significantly lower concentration of dissolved oxygen (5.5 ± 0.8mg/l) compared to that in T_1 (7.5 x 1.3mg/l) and T_3 (6.4 ± 0.8mg/l) 9.50. The mean temperature range of 25.1 ± 1.1^0C to 25.5 ± 1.2^0C and pH range of 6.5 – 9 in all the treatments are within environmental parameters recommended and reported by Viveen *et al.* (1985), Body (1979) for tropical fish optimum growth and nutrient utilization.

This study shows that the use of organic fertilizers in enriching the media in which fry/fingerlings are raised are not only economical means of producing fish but also ensures higher survival rates. Soybean milk filtrate a non-convectional medium competed favourably with poultry droppings as well as the use of fishmeal as food for early stages of fish. A closer look at the three treatments of plankton composition in Table 3.0 shows that a composite combination of the two or the three treatments will probably generate 100% composition of both phyto and zooplanktons to meet the nutrient utilization needs of the fry, there is need to confirm this suggestion through experimentation. But for economic consideration, a combination of T_2 and T_3 will suffice. However, the addition of fishmeal (T_1) can be done when financial consideration is not limiting after the third week. By this time some cost would have been saved and the fish farmer can be sure of a higher survival rate of fry/fingerlings.

Hence, fish farmers should be encouraged to raise fry/fingerling in medium fertilized using soyabean milk filtrate.

Table 1.0: Mean Weight Gain (g) of *C. gariepinus* fry raised in experimental media

Treatments	Initial Total Weight (g)	Final Total Weight (g)	Initial Average Weight (g)	Final Average Weight (g)	Weight gain %
1a	68.87	206.07	0.69	2.24	308.0
1b	68.36	250.29	0.68	2.55	266.7
1c	69.18	216.60	0.69	2.28	302.6
2a	67.95	181.05	0.68	1.85	369.6
2b	67.42	176.68	0.67	1.84	364.1
2c	66.90	167.46	0.67	1.73	289.3
3a	67.84	191.97	0.68	1.98	343.4
3b	68.33	179.94	0.68	1.82	393.6
3c	66.66	183.59	0.67	1.89	354.9

Table 2.0: Survival of *C. gariepinus* fry per week (Nos)

Weeks	T1	T2	T3
0	300	300	300
1	296	296	298
2	291	293	296
3	285	291	293

Table 3.0: Plankton Composition and Abundance (x 10^3) in Individual Treatment Tanks

Plankton component	Affiliation	Control (T_1)	Poultry droppings (T_2)	Soy bean milk filtrate (T_3)
Chaetoceros decipens	P	2.25 ± 0.34	2.50 ± 0.20	3.39 ± 0.47
Anabaena sp.	P	-	-	0.55 ± 0.14
Scenedesmus accuminatus	P	1.17 ± 0.19	2.56 ± 0.01	0.20 ± 0.02
Cyclotella sp.	P	-	-	0.22 ± 0.01
Mycrocystis sp.	P	-	2.21 ± 0.04	-
Euglena viridis	P	0.56 ± 0.14	2.15 ± 0.10	0.52 ± 0.01
Oedogonium sp.	P	-	0.22 ± 0.04	1.02 ± 0.01
Melosira sp.	P	1.10 ± 0.01	-	-
Cosmarium sp.	P	0.18 ± 0.01	0.15 ± 0.03	0.24 ± 0.02
Oscillatoria sp.	P	0.13 ± 0.04	1.25 ± 0.32	1.87 ± 0.11
Pandorina sp.	P	-	0.51 ± 0.10	0.62 ± 0.12
Brachionus sp.	Z	-	0.15 ± 0.02	0.21 ± 0.01
Themocyclops sp.	Z	-	0.12 ± 0.01	0.49 ± 0.03
Lecane sp.	Z	-	0.11 ± 0.01	0.21 ± 0.02
Trichocerca obtusidens	Z	-	0.75 ± 0.10	0.68 ± 0.11
Rotifer	Z	-	-	0.62 ± 0.04
Daphnia	Z	-	-	0.52 ± 0.02
TOTAL		5.39 ± 0.73	12.78 ± 0.98	11.56 ± 1.14

P = Phytoplankton, Z = Zooplankton

Table 4.0: Water Quality Parameters Measured (Mean ± S) in Treatment Tanks

Treatments	Temperature (^{0}C)	Dissolved oxygen (mg/l)	pH
1	25.5 ± 1.0^a	7.5 ± 1.3^a	7.5 ± 0.78^a
2	25.5 ± 1.2^a	5.5 ± 0.8^a	7.9 ± 0.87^a
3	25.5 ± 1.1^a	6.5 ± 0.8^a	7.2 ± 0.81^a

a,b,c - Values along the same row with different superscripts differ significantly from their respective mean values ($P < 0.05$).

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