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COMPARATIVE STUDIES ON THE GROWTH PERFORMANCE OF *CLARIAS GARIEPINUS* FINGERLINGS FED COMMERCIAL FEED AND LIVE ZOOPLANKTON

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ABSTRACT

This study on the growth performance of *Clarias gariepinus* fingerlings fed separately on zooplankton, coppens and a combination of coppens and zooplankton lasted for 8 weeks. Ninety (90) three-week old Hatchery bred fingerlings of *Clarias gariepinus* used for the study were acclimated for three (3) days in a concrete tank measuring 1m x 1m and fed with fishmeal, before commencement of the experiment. The fingerlings were grouped in tens into 9 concrete tanks measuring 1m x 1m x 1m. These tanks were further grouped into threes to give three treatments labeled $A_1 – A_3$, $B_1 – B_3$ and $C_1 – C_3$. Treatment I ($A_1 – A_3$) were fed with zooplankton, Treatment II ($B_1 – B_3$) were fed zooplankton and 3% body weight of coppens, while Treatment III ($C_1 – C_3$) was fed with 5% body weight of coppens only. Zooplankton used was mainly rotifers, branchionus and Cyclops. Total length and weight of fish were measured weekly and used as growth indices. Data collected were analyzed using one way Analysis of variance and means separated by Duncan's Multiple Range Test. Results from the study revealed that Treatments II and III were not significantly different from each other ($P>0.05$) for both length and weight, but were different from Treatment I ($P<0.05$). Based on the result, Treatment II is preferred and is recommended, as the use of zooplankton as feed supplement helps to reduce cost of production and still ensure optimal production.

KEY WORDS: Zooplankton, Coppens, *Clarias gariepinus*, Growth, Production, Treatment

INTRODUCTION

Aquaculture can be defined as the rational rearing of fish in an enclosed and fairly shallow body of water, where all its life processes can be controlled. In Nigeria and the world over, aquaculture is seen as a means of meeting future demand for fish at a time when stocks from the wild are showing signs of depletion. According to Ayinla (2012) aquaculture covers a range of activities from full-cycle aquaculture to grow-out of wild caught juvenile and sub-adults for markets.

The average Nigerian is said to be undernourished, taking less than 13.5g/caput/day of animal protein recommended by the World Health Organization (Ekelemu and Olele, 2010). To be able to meet with this recommendation, fish which is one of the cheapest sources of animal protein has become a major item in the diet of Nigerians. Nigeria's fish production which was once adequate to meet the demand of the populace is now not adequate. The supply though in adequate come from these four major source in order of their contribution (a) importation (b) inland, estuaries and coastal or artisanal (c) aquaculture (d) industrial trawl fishery (Ayinla, 2012). In the last five years, aquaculture production in Nigeria has tripled, standing at a value of about 200,535 tonnes in 2010 (FDF, 2010). This figure is abysmally low, when compared to the estimated annual aquaculture production of 2.5-4.0 million tonnes (Ayinla 2012).

In 2010, projected fish demand in Nigeria was 1,890,000 tonnes, supply was 634,560 tonnes giving a short-fall 1,255,440 tonnes. To meet up with the demand, Nigeria imported about 1.012 million tonnes of fish. Presently about 1,328,508 tonnes of fish supply gap is projected from 2012 (Ayinla, 2012). Aquaculture probably represents the best option to bridge this demand and supply gap. This is because of the large expanse of land and water bodies available in the country, aquaculture is sustainable and the processes can be controlled.

Fish feed is the single most expensive item in fish production (Ekelemu and Ogba, 2005). The farmer will want to use any feed source that is cheap but still assures optimal production. Thus the use of natural feed items in aquaculture can be adopted (Ovie, 2003). Ajayi (2008) opined that zooplankton which is low in the aquatic food chain, play important role in the aquatic food web, both as a resource for consumers at higher levels (including fish) and as a conduit for packaging the organic materials in the biological pump. The use of zooplankton in conjunction with commercial feed is becoming popular, as it helps in reducing cost and quantity of feed fed to fish in aquaculture, improves fish flavor, texture and are a valuable source of protein, amino acids, fatty acids minerals and energy. This paper therefore seeks to study the effect of culturing *C. gariepinus* using the combination of zooplankton and coppens.

MATERIAL AND METHODS

Ninety, 3-week old hatchery bred *Clarias gariepinus* fingerlings were used for the study which lasted for eight (8) weeks. The study was conducted in the Fisheries teaching and Research Farm of Delta State University. Before the commencement of the study, the fingerlings were acclimated for three days in a fish holding tank of dimension 1.0m x 1.0m x 1.0m. During the period of acclimation, fish samples were fed ad-libitum with 100%

fishmeal diet, twice daily. The fingerlings were thereafter randomly distributed in tens into nine (9) concrete tanks labeled A_1-A_3, B_1–B_3, C_1-C_3. Each of the tanks measuring 1.0m x 1.0m x 1.0m was filled with borehole water to ¾ levels. Fingerlings in tank A_1-A_3 (treatment I) were fed with only zooplankton twice daily. Those in tanks B_1–B_3 (treatment II) were fed coppens at 3% body weight twice daily in addition to supplies of zooplankton at each feeding time. Fingerlings in tanks C_1- C_3 (treatment III) were fed with coppens at a rate of 5% body weight twice daily.

Length (cm) and weight (g) were measured weekly for 8 weeks and used as growth parameters. Data collected were subjected to analysis of variance and means separated using DUNCAN'S multiple range test. (SAS, 1998)

RESULTS

Presented in tables 1 are the mean weekly weight (g) gain, in each of the triplicate treatment tanks. The highest weight of 44.0 g from an initial weight of 2.1 g, representing the best growth was recorded in Tank C_3 in Treatment III, where fishes were fed with only coppens. The lowest weight of 5.7 g from an initial weight of 2.8 g was recorded in Tank A_3 in Treatment 1, which was fed with only zooplankton

TABLE 1: Mean weekly weight (g) gain of fish in the treatment tanks

Tanks	Weeks								
	Initial	1	2	3	4	5	6	7	8
A1	2.5	3.2	3.5	3.7	4.0	4.4	4.7	5.5	7.0
A2	2.0	2.3	2.5	2.6	2.8	3.2	3.5	3.9	6.0
A3	2.8	2.9	3.1	3.7	3.8	3.9	4.2	4.6	5.7
B1	3.0	3.3	4.4	6.8	9.3	13.9	18.9	23.8	32.2
B2	2.1	3.7	4.7	6.7	9.4	12.8	17.4	21.0	32.0
B3	3.0	4.0	5.2	8.0	11.2	15.3	21.6	25.0	36.8
C1	2.0	3.6	5.1	7.3	10.3	14.8	21.0	**23.9**	35.0
C2	1.8	2.4	3.6	4.3	5.2	7.5	9.2	10.1	12.3
C3	2.1	3.0	5.1	7.9	11.9	17.7	26.7	33.6	44.0

Shown in Table 2, are the mean weekly variations in length (cm), in the triplicate treatment tanks. Fish samples in treatments Tank A_3 in Treatment 1, fed with only zooplankton, consistently displayed poor growth, in having mean lengths in the range of 8.7 – 9.3 g. Those in Treatment II (Tanks B1 – B3), constantly showed the best growth, in having lengths ranging from 15.3 - 16.2 g. However, the largest mean length of 16.7 g was recorded Treatment III, Tank C_3, fed with only coppens.

TABLE 2: Mean weekly increase in length (cm) of fish in the treatment tanks

Tanks	Weeks								
	Initial	1	2	3	4	5	6	7	8
A1	6.0	6.3	7.1	7.5	7.8	8.0	8.3	8.8	9.3
A2	5.7	6.0	6.5	7.0	7.3	7.5	7.6	7.7	8.7
A3	5.9	6.4	7.0	7.5	7.8	7.9	8.1	8.4	8.9
B1	6.3	7.2	8.0	9.3	10.3	11.5	12.9	14.1	15.3
B2	5.3	7.4	8.1	9.2	10.2	11.6	12.6	13.5	15.4
B3	6.2	7.4	8.5	9.7	10.9	12.2	13.7	15.4	16.2
C1	5.8	7.2	8.3	9.6	10.7	12.1	13.6	14.3	16.0
C2	5.4	6.5	7.2	7.7	8.4	10.1	10.3	10.6	11.3
C3	6.0	6.9	8.2	9.7	10.9	12.5	14.2	15.3	16.7

The result of analysis of variance for weekly weight (g) in the treatment tanks, presented in Table 3, show fish samples in Treatment II, fed with the combination of zooplankton and 3 g body weight of coppens, to be better and significantly different (P < 0.05) from those in Treatments I and III, fed with only zooplankton and 5 % body weight of coppens respectively.

TABLE 3: Analysis of Variance of Mean Weekly Weight (g) of Fish in the Treatment tanks

Treatments	WEEKS							
	1	2	3	4	5	6	7	8
A I	2.8 ± 0.27^{a}	3.03 ± 0.29^{b}	3.33 ± 0.37^{b}	3.53 ± 0.37^{b}	3.83 ± 0.35^{b}	4.13 ± 1.33^{b}	4.67 ± 0.46^{b}	6.23 ± 0.39^{c}
B II	3.67 ± 0.20^{a}	4.77 ± 0.23^{a}	7.17 ± 0.42^{a}	9.79 ± 0.62^{a}	14.0 ± 0.72^{a}	19.13 ± 1.27^{a}	23.27 ± 1.19^{a}	33.67 ± 1.57^{a}
C III	3.0 ± 0.35^{a}	4.6 ± 0.50^{a}	1.50 ± 1.11^{c}	9.07 ± 2.09^{a}	13.33 ± 3.03^{a}	18.90 ± 5.22^{a}	22.52 ± 6.82^{a}	30.43 ± 9.43^{b}

Means with the same alphabet as superscript vertically are not significantly different (P>0.05)

In Table 4 is presented the result of analysis of variance for increase in length of fish samples in the treatment tanks. The result shows fish samples in Treatment II, fed with a combination of zooplankton and 3 % body weight of coppens to be significantly different (P < 0.05) from Treatment I and slightly better but not significantly different (P > 0.05) Treatment III.

TABLE 4: Analysis of Variance of Mean Weekly Length (cm) of Fish in the Treatment tanks

Treatments	WEEKS							
	1	2	3	4	5	6	7	8
A I	6.23±0.12[a]	6.87±0.19[b]	7.33±0.17[b]	7.3±0.50[b]	7.8±0.15[b]	8.0±0.21[b]	8.3±0.32[b]	8.97±0.18[b]
B II	7.33±0.67[a]	8.2±0.15[a]	9.4±0.15[a]	10.47±0.22[a]	11.77±0.22[a]	13.07±0.33[a]	14.33±0.56[a]	15.63±0.29[a]
C III	6.87±0.20[a]	7.9±0.35[a]	9.0±0.65[a]	10.0±0.80[a]	11.57±0.74[a]	12.70±1.21[a]	13.40±1.43[a]	14.67±1.40[a]

Means with the same alphabet as superscript vertically are not significantly different (P>0.05)

Table 5 shows the summary of analysis of variance for the mean weekly gain in weight and length of fish samples. The result shows that Treatments II and II are not significantly different (P > 0.05). However both are significantly different (P < 0.05) from those of Treatment I.

TABLE 5: Summary of Analysis of Variance for Mean Length (cm) and Weight (g) of Fingerlings

Treatment	Weight	Length
A I	6.23±0.39[b]	8.97±0.18[b]
B II	33.67±1.57[a]	15.63±0.29[a]
C III	30.43±9.43[a]	14.67±1.70[a]

Means with the same alphabet as superscript vertically are not significantly different (P>0.05)

DISCUSSION

Fish feed has constantly remained the single most expensive item in fish production (Nweke and Ugwumba, 2005) this situation is further aggravated by the soaring price of the commercially prepared fish feeds. The result of this study has shown clearly the possibility of culturing *Clarias gariepinus* using a combination of live zooplankton and conventional feed to reduce cost and optimize production. This result is supported by Adeogun *et al.* (1999) who reported that fish production in aquaculture is based on reduction in cost of production; by using the best available natural food in combination with conventional fish feed. The reduction in cost of production and optimization of production and profit is due to the fact that the natural food is rich in protein and nutrients not available in the processed feeds (Ayanda, 2003).

Survival rate and production from this study was higher in treatment II which was fed zooplankton in combination with coppens. This result is supported by the finding of Ovie (2003), who observed that the growth and survival of fingerlings are enhanced when fed live forms of plankton. The use of live food (zooplankton) in combination with commercial feed in aquaculture is advocated as the live food can be accepted by C. *gariepinus* at any stage of growth. The *C. gariepinus* in treatment II, fed zooplankton in combination with coppens was also observed to elicit a stronger feeding habit, when compared to fishes in treatment III, that were fed only coppens. This observation is supported by ovie,(1986), who stated that in-door hatchery mortality of fingerlings have been linked to non-availability of live food.

This study has revealed that *Clarias gariepinus* can be cultured wholly on natural food in the pond but production will be poor. However when cultured using a combination of live zooplankton and the commercially prepared feed, production is comparable to those cultured using 100% commercial feed if not higher. This is seen from the results of treatments II and III in this study which were not significantly different (P > 0.05) from each other but were significantly different from those in treatment 1 (P < 0.05), which were cultured using only zooplankton. Farmers are therefore encouraged from this study to incorporate the use of zooplankton in the feeding of fish thereby leading

to reduction in the ration of feed supplied to the fishes. This ultimately will reduce cost of production while still maintaining optimum production and maximizing profit.

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