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EFFECT OF RATION LEVEL ON THE GROWTH AND DEVELOPMENT OF *CLARIAS GARIEPINUS*

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ABSTRACT: This investigation was carried out to study the effect ration level will have on the growth and development of African catfish (*clarias gariepinus*). The research was carried out in the hatchery section of Zoology department, Nnamdi Azikiwe University, Awka and it lasted for eight weeks. The fish were subjected to different levels of ration feeding, (3%, 5%, 7% and 9% body weight ration level). The results show that those fed on 5% body weight ration level recorded the highest weight increase (106.64g) while those fed on 3% body weight ration level recorded the least weight increase (79.67g). The results also show that those fed on 5% body weight ration level recorded the highest value of specific growth rate (0.103) while those fed on 3% body weight ration level recorded the least value (0.083). ANOVA statistical method was used to analyze the results and I discovered that there was no significant difference among the treatments in both cases. The P values 0.091 and 0.075 recorded respectively are greater than 0.05, i.e. (0.091 > 0.05) and (0.075 > 0.05). Based on the results we recommended that feeding the juvenile of *Clarias gariepinus* on 5% body weight ratio is the best ration level to feed in order to reduce cost of culture, get the highest maximum size of fish and also maximize profit.

INTRODUCTION

Fish farming is becoming more and more popular especially in the developing countries. Agboola (2011) stated that "aquaculture has primarily been a developing world activity, especially in the Asian countries". In Africa too fish farming is spreading very fast and this is because fish is an excellent source of animal protein and affordable. This makes it to be a good replacement for beef which is more expensive. Robin (2011) stated that fish and beef are excellent complete protein source, meaning they contain all the essential amino acids. She went further to compare both in terms of fat and fish has a definite edge over beef. With ever growing world population the demand for fish consumption is ever growing, especially in developing countries. Ajayi and Talabi (1984) stated that "the prevailing reliance on fish as the main source of animal protein is a consequences of production difficulties in the livestock sector". Of course, the difficulties in the livestock or animal production have pushed so many animal farmers into fish farming. Even with all the effort from farmers, they've not been able to meet the animal protein demand, especially fish demand. Tabor (1990), despite this growing demand in the fish protein and growth in fish production, Nigeria has not been able to meet the consumption demand estimated at 1.56267 metric tons.

Since fish is an affordable source of animal protein, it is necessary that effort should be made to improve on the level of fish farming in Nigeria, with the country losing about N50 billion in foreign exchange due to fish importation, (Nwuba and Onuora, 2007). A lot of people are going into fish farming but many are still operating at small scale and this has continue to limit the quantity of fish produced which has led to shortage in meeting the demand. Ekwegh (2005) stated that although fish farming started in Nigeria over 40 years ago, but the scale or level at which it is, is still low. Delcado et al (2003) stated that "on developing countries artisanal fishermen and fish workers are often among the poorest people and they generally operate on small scale and use traditional fisheries practices". There have been mixed feelings about fish farming or aquaculture because while some are saying that aquaculture is lucrative, others are saying that it is not lucrative. This had made some to leave the business or made some not to go into it. Professionally speaking fish farming is lucrative, but poor knowledge and management have made some to leave the business or not to enter into the business. To achieve success in fish farming, one must abide by sound management practices for fish farming (Ugwaka, 2014). In its Package of Practices (POP), USAID, (2010) stated that there is need for best management practices in fish farming for success to be attained. It is necessary to have a good knowledge of fish culture for one to do well in aquaculture. Natural food for fish in the water which is plankton is not sufficient and due to this supplementary feed must be given to the fish. In intensive fish culture the artificial feed is the main food for the fish. Adeniji and Ovie (1987) identified that living food resources in fish culture system has been a major problem in fish culture system in today's fish farming. This shows in commercial fish farming, artificial feed must be used. Bolorunduro (2002) stated that in the absence or shortage of natural foods, nutritionally complete manufactured feeds that contain all essential nutrients must be fed to fish. Feeding consist 40-60% of production cost in aquaculture, (USAID, 2013), and this makes it imperative to feed the fish appropriately so as not to waste resources and increase the production cost unnecessarily. Gatlin, (2002) stated that nutrition plays a critical role in intensive aquaculture because it influences not only production cost but also fish growth. Feeding with the right ration level encourages maximum growth of fish and eliminates waste and reduces production cost, (Ugwaka 2014). This paper aimed to determine the right ration level that will encourage maximum growth and development in African catfish (*Clarias gariepinus*).

MATERIALS AND METHOD

A total of 120 juvenile of *clarias gariepinus* from the same parents, of similar size and same age were used for this research. The juveniles have an average size of 8.5g per fish. They were acclimatized for 7 days before the start of the experiment. The juvenile were reared in a makeshift fish tank of 100 litres plastic basin filled with 70 litres water. The fish were subjected to 4 different treatments of 3%, 5%, 7% and 9% body weight feeding and each treatment was replicated 3 times. The rearing plastic tanks/ basins were constructed to be semi or partial flow through system, where there is water inflow pipe with tap and water out flow tap to control the water. All the experimental units were connected to the same water source. The fish were stocked 10 fish per basin. The fish were fed with different quantities of feed, 3% body weight for the first treatment, 5% body weight for the second treatment, 7% body weight for the third treatment and 9% body weight treatment for the fourth treatment. The feed was produced locally by the researchers and the crude protein content was 45%. The water quality parameters were monitored from the beginning of the experiment to the end and they include temperature, pH, dissolved oxygen and free carbon dioxide. These parameters were maintained at comfortable range for fish culture. The experimental diet was formulated using locally available feed materials which include soyabeans, maize, fish meal, sorghum, groundnut cake, shrimp waste, blood meal, vitamin premix and mineral mix. Table below shows the various quantities of ingredients

Table 1: Feed components

COMPONENTS	**QUANTITY in g/ 100g**
Fishmeal	45
Shrimp waste	5
Blood meal	5
Soya bean	5
Groundnut cake	14
Maize	10
Sorghum	10
Vitamin premix	2
Mineral mix	4
Total	100g

The study lasted for 8 weeks. The fish were weighed every 2 weeks and the weights recorded and the new quantity of feed to be fed to the fish calculated so that they won't be under fed. The recorded data from the study were analyzed and compared for significant differences among the treatments using ANOVA procedures

RESULTS

Table 2: bi-weekly weight increase of *clarias gariepinus* fed on 4 different ration levels for 8 weeks in grams.

Treatment/ ration level	Initial weight	Weight at week 2	Weight at week 4	Weight at week 6	Weight at week 8
3%	8.50	9.47	10.09	14.00	15.27
5%	8.50	10.76	11.82	15.22	17.55
7%	8.51	10.24	10.46	15.33	16.82
9%	8.51	9.64	10.30	15.73	17.26

Table 3: percentage weight gain of *clarias gariepinus* fed on 4 different ration levels for 8 weeks

Treatment	Total weight	Mean	SE
3%	239.01	79.67	14.3912
5%	319.91	106.64	14.4518
7%	203.97	97.99	16.6254
9%	308.06	102.69	9.7144

Table 4: specific growth rate of *clarias gariepinus* fed on 4 different ration level for 8 weeks

Treatment	Total weight	Mean	SE
3%	0.248	0.083	0.011
5%	0.309	0.103	0.010
7%	0.290	0.097	0.012
9%	0.302	0.101	0.007

Table 5: Analysis of variance for the different growth parameters

Source/treatment	Sum of squares	Df	Mean square	F	sig
%age weight gain	1278.842	3	426.281	3.478	0.091
Specific growth rate	0.001	3	0.00	3.87	0.075

Some vital water quality parameters were monitored, measured and recorded during the study. These parameters were maintained at acceptable range.

Table 6: water quality parameters monitored during the experimental period.

Water quality parameter monitored	Value
Temperature	21.4°C – 26.2°C
pH	6.13 -7.07
Dissolved oxygen	0.52mg/l – 8.36mg/l
Free carbon dioxide	0.00 - 4.05ppm

The table above shows that the parameters were within acceptable range for the rearing of catfish in the tropics AOAC (1990)

Three growth parameters were considered and the data collected were used to compute these 3 parameters namely: weight increase, percentage weight gain and specific growth rate. The values obtained for these growth parameters were recorded in tables above. ANOVA procedure was used to determine the level of significance between the different treatments within the growth parameters, percentage weight gain and specific growth rate namely.

Table 2 shows that there were weight increase among all the treatments but the second treatment, those fish fed with 5% body weight ration level recorded the highest weight increase, (17.55g) at the end of 8 weeks, followed by those fed with 9% body weight ration level (17.26g), followed by those fed 7% body weight ration level (16.82g) and the least weight increase was recorded by those fed 3% body weight ration level (15.27g). This shows that those fed with 5% ration level grew the best and saves cost. Hypoxia was adduced to be the reason why those fed with 5% body weight ration level grew more than those fed with 7% and 9% body weight ration level because the excess feed which they could not consume released excess nitrogen into the water (Craig *et al*, 2009). This reaction reduces the available dissolved oxygen in the water which is stressful to the fish and leads to reduced food intake and respiration.

Table 3 recorded the percentage weight gain of the fish subjected to 3%, 5%, 7% and 9% body weight ration level feeding. The table shows that the highest value was recorded for those fed with 5% body weight ration level (106.64), followed by those fed with 9% body weight ration level (102.69) and the least value was recorded for those fed with 3% body weight ration level (79.67). Looking at the ANOVA analysis in table 5, it shows that there was no significant difference among the treatments at ($p \leq 0.05$). The value recorded was 0.09 which higher is than 0.05 and this shows that there was no significant difference even though those fed with 5% body weight ration level recorded the highest percentage weight gain. Looking at the table 4, it shows that those fed on 5% body weight ration level recorded the highest growth rate value (0.103), followed by those fed on 9% (0.101) and least value was recorded for those fed on 3% body weight ration level (0.083). The ANOVA analysis in table 6 reveals that there was no significant difference at ($p \leq 0.05$) among the treatments even though that those fed on 5% body weight ration level recorded highest value.

CONCLUSION

From the study results the fish fed on 5% body weight ration level recorded the highest weight increase, followed by those fed on 9% body weight ration level, while the least weight increase was recorded by those fed on 3% body weight ration level. The reason those fed with 3% body weight ration level recorded least weight increase was because they were under fed and thereby couldn't attain there possible maximum weight. They did not receive enough nutrients for maximum growth and thereby their growth was stunted. Those fed on 7% and 9% body weight ration did not grow up to the size of those fed on 5% body weight ration level even though they were fed more was because the feed given to them were in excess of what they need. The excess feed then caused hypoxia (water low in dissolved oxygen). In these two treatments (7% and 9% body weight ration level) the excess feed given the fish release excess nitrogen into the water causing accelerated eutrophication which leads to hypoxia (Craig et al, 2009). The low level of oxygen in the water causes some level of stress to the fish. This situation makes the fish to consume less feed because they don't have enough oxygen to breakdown the feed already eaten (respiration) before they can eat another one. Those fed on 5% body weight grew best because they finished their feed and there was little or no leaching of excess nitrogen into the water and there was no hypoxia. They had enough oxygen for respiration which helps to release necessary nutrients especially energy and nutrients for growth which spares enough protein for tissues building and growth. This study shows that feeding at 5% body weight ration level is ideal for maximum growth, it also helps to reduce the cost of production in fish farming or aquaculture because the fish were given the right quantity of feed they need for maximum growth. Feeding on 5% body weight will ensure the farmer to generate maximum revenue from the farm. This shows that feeding on 5% body weight is economical because it reduces cost and increases revenue.

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