Use of chicken manure and practical diet in the culture of *Oreochomis niloticus.*

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Abstract

Experiments were conducted for eight weeks to compare the growth of *Oreochromis niloticus* by feeding them separately with a nutritionally balanced diet, chicken manure, and a plant protein-only based diet in three concrete tanks. At the end of the study, the fish in tank A fed with the nutritionally balanced diet attained average weight of 112.35 g compared with 120 g for fish in tank B which received poultry manure. But in the third tank C, where all plant protein diet was fed weighed 97.8 g. Fish production extrapolated for an eight month grow-out period was 11594.20 kg/ha in the tank where chicken manure was applied compared with 10806.76 kg/ha in the tank where a practical diet was fed. In the third tank where an all-plant protein diet was fed, fish production was 940.10 kg/ha extrapolated for an eight month grow-out period. Dissolved oxygen in the experimental tanks fluctuated between 5.05 mg/L and 8.65 mg/L, and appeared not to have a factor in the growth of fish. Plankton analysis contained identical plankton but tank B more of spirullina, chorella, mysids, than the other two tanks.

Keywords: Aquatic animals, Intensive aquaculture, Tilapia nilotica, Fish.

Accepted on 05 November, 2021

Introduction

When natural foods are not available in sufficient quantity to provide nutrients for fish growth, feeds that are manufactured or grown outside the fish ponds may be fed to the fish at regular intervals. These may not be nutritionally complete and will not adequately support fish growth, in the absence of natural foods. Some examples of supplementary fish feeds are commercially produced rations for chickens and pigs, rice bran, manioc leaves, kitchen refuse, oil-seed cakes or other agricultural products and by products. It was remarked that heavily fertilized ponds which are rich in nutrients are suitable for the culture of such as tilapia, silver carp, common carp, snake head (*Ophicephalus argus*) [1].

It was observed that practical fish culture has become predominantly-practiced aquaculture in many areas of the world and necessitates the application of practical diets for the rearing of fish [2].

It was observed that the use of organic manure cannot be underrated. They described how the organic manure could be immediately assimilated by organic fauna and especially by the zoo plankton or even by the fish. The organic manure would be broken down by the decomposing organism and turned into inorganic nutrients on which the planktonic algae were feeding [3]. Organic manure also increases production of carbon dioxide which is essential for the development of the aquatic animals. Scientific knowledge on basic nutritional requirements and practical diet for feeding is restricted to a few species of fish. Availability of dietary ingredients in a particular area, and means of preparation and storage of these materials often determines many of the techniques of fish culture employed.

Tilapia which are native of Africa, are disease resistant, reproduce easily, eat a wide range of food, and tolerate poor water quality with low dissolved oxygen level. Most tilapia will grow in brackish water and some will adapt to full strength sea water. These characteristics make tilapia suitable for culture in most developing countries. They are often grown in ponds, cages and rice field.

It was observed that for the nutrition of tilapia, an abundance of plankton, algae and other pond organisms is essential. Their growths are stimulated by manuring culture ponds with organic wastes like organic effluents as in South-East Asia, and green stuff used in Indonesia [4]. He also remarked that the use of vegetables by products such as rice-bran, broken rice, oil cakes and rotten fruits also contributes to the manuring giving additional pond food production. In tilapia ponds in which organic manuring was practiced as in Singapore, the production figure per hectare was 1700 kg/ha.

It was remarked that supplementary feeds are often nutritionally in-complete and would be inadequate as a sole source of food, and that their function is to provide additional major nutrients which the fish obtain by consuming natural food organisms [5]. In extensive culture systems, species such as *Oreochromis niloticus*, *Oreochromis aureus*, *Orechromis*, *Hornarum*, and *Oreochromis mossambicus* food variously on a range of plankton, benthic invertebrates, vegetations and algae. This is an important characteristic of the group, culture methods were initially developed based on the enhancement of natural feed supplies of the pond. It has given the production figure for tilapia from various production systems as follows; extensive system with no inputs yielded 150 kg/ha/250 days. But in extensive culture where organic fertilizers were applied, yields of 1000 kg/ha/were obtained in 250 days. In semi-intensive culture system where rice-brain was applied, production was approximately 1650 kg/ha in 160 days. But in the same culture system where feeding with supplementary diets was adopted, yield of 3500 kg/ha/180 days was obtained.

Fish meal is the major component of aquaculture feeds and will provide the main source of protein, which may constitute 60% of the total diet. Therefore intensive aquaculture has become heavily dependent on the use of high grade fish meals. But since fish meal is expensive, its use in the third World countries is limited to a few entrepreneurs and Government funded research establishments. Use of organic wastes is not well documented in Nigeria, although high production figures have been recorded in such countries as Israel, Thailand and Philippines, in farms where liquid manure or animal wastes were applied.

It was remarked that the supplementary feeds used in semi-intensive aquaculture range widely in type from kitchen wastes to nutritionally complete formulated diets [5]. These feeds may be inform of single ingredients or compounded into dough balls or pellets [6]. It was observed that the basis of supplementary feeding in semi-intensive aquaculture was to provide energy and nutrients in addition to those available from natural food organisms. In order to optimize growth, the feed formulations and ration sizes should be selected on the basis of the density and the standing crop of fish.

Materials and Methods

The feeding experiments were carried out in three concrete tanks designed A,B,C, each measuring about 3.6 × 4.6 × 1 m respectively.

Source of experimental fish

One hundred and twenty fingerlings of Tilapia nilotica were obtained from the production pond of a commercial fish farm at Badagry in Lagos State Nigeria. The experimental fish were first acclimatized in a holding tank for two days preparatory to stocking in the concrete tanks. Fingerlings weighed on the average 0.5 g.

Composition of feed and formulation of experimental diets

The diets used in this study were prepared from maize, fish-meal, soya-bean meal, vitamin pre-mix, oysters, binders, oil and poultry waste in the following proportions as shown in Tables 1 and 2.

Table 1. *Composition of a complete fish diet.*

Ingredients	Quantity(kg)	Percentage (%)
Maize Meal	1.7	34
Fish Meal	2.0	40
Vitamin Premix	-0.005	01
Oysters	0.004	0.08
Soya Bean Meal	1.0	20
Binders	0.019	0.38
Oil	0.272	5.44
	5.000 kg	100.00%

Table 2. *Composition of an incomplete fish diet.*

Ingredients	Quantity(kg)	Percentage (%)
Maize Meal	2.0	40
Soya Bean Meal	2.0	40
Vitamin Premix	1.0	20
	5.00 kg	100%

The maize grains were ground with the grinder from the science laboratory a of research institute in Lagos State Nigeria. Also the soy-bean grains after toasting for two hours using the electric oven in the biology laboratory to remove the poisonous substance were ground using the same procedure.

Miscellaneous fish were obtained and placed in an oven to remove available moisture. Subsequently the fish were finely ground together with oyster shells and the resulting mixture was added to the remaining raw feed ingredients and subjected to further milling using a portable mill.

Preparation of ponds

Three rectangular tanks designed A, B, C, were used for the study. The three tanks were drained completely and thoroughly washed to rid them of fish and other pests.

Stocking

Stocking was done early in the morning to minimize mortality caused by fluctuating temperature and other stressors. The fingerings were stocked at fourty per pound and each weighed approximately 0.5 g.

Feeding of the fish

The fish were subjected to three different treatments as follows. Fish in pond A received a practical diet that was nutritionally complete. Fish in pond B were fed with dried poultry waste at the rate of 0.5 kg/day obtained from a nearby poultry/house. Fish in pond C were fed with an all-plant protein diet. Fish were fed twice daily in the morning and in the evening at sun-set, except on sampling days when feeding was done after weighing, Feeding rates were adjusted fortnightly based on results of sampling exercises.

Temperature measurement

The temperature of the water was measured twice daily with the aid of a mercury in-glass thermometer. The mercury in-glass thermometer was dipped into the water and allowed to remain for 5 minutes and reading was obtained as the thermometer was brought out. This was usually done twice daily in the morning and evening usually before feeding. Other physiochemical parameters such as pH, turbidity, were measured with the aid of a water quality checker Horiba Model U-10.

Plankton studies

Plankton was collected with the aid of suitable plankton net for qualitative and quantitative analysis. A pour-through method was adapted where by a graduated bucket was used in collecting 100 liters of water randomly in each pond. Plankton collected was put in a sample bottle and 5% formalin.

Test cropping

Sampling was carried out at two weeks intervals to monitor the growth of fish in the three concrete tanks. Twenty fish in the three concrete tanks. Twenty fish were randomly sampled from each tank with the aid of a drag net, and their combined weights were obtained using a suitable scale. Eight weeks after the study was initiated, the three tanks were complete drained and fish recovered were counted and weighed.

Results

Average body weights of fish at the end of eight weeks feeding trials are shown in Tables 3-7. The fish in pond B attained the largest weight of 120.5 g. In pond A, the fish each weighed approximately 112.35 g while the least weight was in pond C where the fish each weighed approximately 97.8 g at harvest. Fish production extrapolated for a grow-out period of 8 months in tank A was 10806.76 kg/ha. Production of fish in tank B with poultry waste was 11594.2 kg/ha white production in tank C with all plant diet was 940.10 kg/ha (Tables 3-7).

Table 3. *Weight of Tilapia nilotica measured over three periods.*

Date	Pond A	Pond B	Pond C
Stocking	0.5	0.5	0.5
13/8/21	14.62	42.53	27.35
01/9/21	107.27	1105	93.5
14/9/21	112.35	120.5	97.8

Table 4. *Average weekly values for pH in the three ponds.*

Weeks	Pond A	Pond B	Pond C
1st	8.69	7.90	7.86
2nd	7.65	7.50	7.80
3rd	6.50	7.65	9.01
4th	8.10	7.85	7.59
5th	8.70	7.84	7.72
6th	9.30	8.06	7.90
7th	9.17	8.40	8.31
8th	9.20	8.50	8.40

Table 5. *Average weekly values for dissolved oxygen in the three ponds.*

Weeks	Pond A (mg/L)	Pond B (mg/L)	Pond C (mg/L)
1st	6.52	8.01	6.0
2nd	5.55	8.50	7.0
3rd	5.05	6.75	8.5
4th	8.65	7.59	7.8
5th	8.41	8.43	8,48
6th	8.11	8.15	8.15
7th	8.58	8.49	6.75
8th	8.60	8.55	6.65

Table 6. *Plankton quality in the experimental units.*

Organisms	Pond A	Pond B	Pond C
Spirullina	400	550	380
Oscillatoria spp Spp	200	350	180
Acella spp	120	200	108
Mysid	200	450	198
Paramecium spp	141	210	112
Euglena	101	132	104
Spirogyra	200	410	198
Chorella	395	550	320
Daphnia spp Spp	102	200	104

Table 7. *Growth and feed utilization of Tilapia nilotica in three ponds.*

Parameters	A	B	C
Initial weight (g)	0.5	0.5	0.5
Final weight (g)	112.35	120.5	97.8
Duration of culture	60	60	60
Weight gain/day	1.87	2	1.62
Mortality	7	9	6
Survival rate (%)	8.25	77.5	85
Food conversion rate	1.12	1.04	1.28

Discussion

From the results of the study, the largest weight of fish was obtained from pond B where the fish were fed with poultry waste. Possible reasons for this may include the fact that the decomposition of poultry waste would have released nitrogen, phosphorus, potassium and other nutrients which were used by phytoplankton for growth and reproduction. More food was therefore available for fish to covert to flesh. The waste may also have provided suitable attachment sites for other micro-organisms equally used by tilapia as food.

Pond A where the nutritionally complete diet was fed recorded the second largest weight while the least weight was from pond C with only plant diet. Plant proteins are usually deficient in lysine and methionine which are essential amino acids utilized by animals for good growth. It has also been shown that when all plant protein diets are used in the culture of fish growth will usually be negatively affected because of its amino acid profile. It is also possible that trypsin inhibitors may not have been sufficiently destroyed during toasting of soya-beans, and may have contributed to this growth problem.

Identical plankton was found in the experimental units. But treatment B with poultry waste produced the largest number of plankton because of the rapid decomposition of the organic components. Waste such as was used in the study would usually encourage the growth of phytoplankton, zooplankton and other benthic organisms. Temperature ranged between 26.00% and 27.8% consistent with the recommendation of 13°C-38°C for culture of *Tilapia spp* [7].

The pH also favored the growth of fish. It ranged between 6.50 and 9.30 in line with the recommendation [8]. The dissolved oxygen concentrations in the concrete tanks range between 5.05 mg/L and 8.58 mg/L, and appeared not to have had any negative influence on the growth of fish [9].

The mortalities in the three treatments were 7, 9 and 6 giving survival rates of 82.5% 77.5% and 85% respectively. Improper handling and other introduced stereos during sampling conducted fortnightly may have been responsible for the mortalities recorded.

There was reproduction in the three tanks but no efforts was made to record the numbers of juveniles. This was expected as no attempt was made to set the fish prior to stocking. During the duration of study, it was assumed that the fry and fingerlings arising from the reproductive behavior did not affect the growth of the experimental fish.

Conclusion

Although the chicken manure treatment produced the better results with regard to growth of fish. Since the treatments were not replicated, it may be difficult to conclude that similar results would be obtained in other locations. Available information will suggest that fish fed a nutritionally complete diet should put on more that fish fed on chicken waste which is a poor quality feed and low grade organic Fertilizer. Further experiments where treatments are replicated for purposes of statistical analysis should be carried out to authenticate the results of the present study.

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