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The effect of different feeding rates on growth of Tilapia hybrid fingerlings (Exotic *Oreochromis niloticus* x Exotic *Oreochromis aureus*) reared in Hapas (Cages)

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ABSTRACT: Tilapia hybrid fingerlings (exotic *Oreochromis niloticus* male x exotic *Oreochromis aureus* female) were fed 40% crude protein diets at 1%, 3%, 5%, 8% and 10% body weight in hapas in triplicate. The variation in the growth rate was monitored for 8 weeks.

Growth rate of the hybrid fingerlings increased with increasing feeding rate at 1%, 3%, 5%, 8% and 10% of the body weight. The feed cost also increased with increasing feeding rate. The recommended feeding rate for Tilapia hybrid fingerlings in hapas (cages) is 3% body weight to ensure cost effectiveness.

Key Words: Tilapia; *Oreochromis niloticus*; *Oreochromis aureus*; Hybrid fingerlings; Growth rate.

Introduction

The relative ease of Tilapia culture and its rapid growth rate has led to its wide spread distribution in nearly all the fish farms in Nigeria. The major set back to Tilapia culture is its prolific tendency, which lead to overcrowding and stunted growth of the species. Hybridization is thus favoured as the best way of improving the growth rate of Tilapia and reducing its prolific tendencies.

The National Institute for Freshwater Fisheries Research is currently experimenting on hybridisation of two exotic tilapia species namely *oreochromic niloticus* x *Oreochromis aureus*. One of the ways of determining the growth potentials of these hybrids is to conduct feeding trials.

The feeding rate commonly used in most feeding trials involving tilapia range from 2 to 10% (Campbell, 1980; Cruz and Laudencia, 1977). Mazid *et al* (1979); Winfrey and Stickney, 1981; Jauncey, 1982a; Ross, 1982; Sado, 1991; Eyo *et al.*, 2000). These feeding rates are often chosen without consideration on the cost effectiveness of the feed.

The use of appropriate feeding rate for culture of juvenile tilapia will reduce feed wastage and thereby save cost.

This experiment was therefore undertaken with the objective of determining the feeding rate for accelerated growth of tilapia hybrid fingerlings (exotic *Oreochromic niloticus* (male) x exotic *Oreochromis aureus*(female) reared in hapas.

Materials and Methods

Experimental fish

Fish used for the experiment were tilapia hybrids produced by crossing male exotic *Oreochromis niloticus* with female exotic *Oreochromis aureus* at the Institute hatchery complex. Fingerlings were collected from the outdoor tank and kept indoors for two weeks before they were transferred to net hapas in an outdoor concrete tank to acclimatise. During the period of acclimation, the fish were fed twice daily with NIFFR pelleted feeds containing 40% crude protein.

Experimental conditions

Fifteen hapas (net cages) 1m x 1m x 1m were used for the experiment. The hapas were suspended in outdoor concrete tanks 10 x 10 x 1.5m in such a way as to leave $\frac{1}{4}$ of the hapas immersed in the tank water which had previously been fertilized with chicken manure.

Feed preparation and feeding

Thirty fingerlings of tilapia hybrids of homogenous sizes were weighed into each of the 15 hapas. 40% crude protein diet was formulated using local ingredients namely fish meal 11.5g, groundnut cake, 25.3g; soyabean meal, 24.5g; blood meal, 9.0g; yellow maize, 27.2g; vegetable oil, 1%; bone meal, 0.5g and vitamin premix, 1g.

The weighed ingredients were ground in a hammer mill made into a dough with warm water and pelleted using a hand cracking pelleteer. The wet pelleted food was sun-dried and ground in a laboratory mortar into tiny particles acceptable to the fish.

The crushed pellets were then weighed at 1%, 3%, 5%, 8% and 10% of the fish body weight in each treatment replicated thrice.

Feeding was done twice daily 9.00 a.m. and 5.00 p.m. Weight measurements of the experimental fish was carried out bi-weekly to monitor their growth response to the feed. The experiment was terminated after 56 days of observation.

Physico chemical parameters

The physico-chemical parameters of the water in the concrete tank examined were pH, temperature, dissolved oxygen, conductivity and water transparency (APHA, 1981). The mean temperature ranged from 29.0-31.5°C which is a tolerance range for tilapia. The dissolve oxygen ranged from 68mg/l which fall within the acceptable range for the culture of tilapia. The mean pH range was 7.5-7.6, water transparency was 0.30m and conductivity ranged between 180-200 µmhos/cm. These conditions were appropriate for the raising of tilapia.

Food utilization parameters

The food utilization parameters examined were specific growth rate, food conservation ratio and protein efficiency ratio.

Statistical analysis

Data were subjected to statistical analysis to determine significant differences between means using Analysis of Variance (ANOVA).

Chemical composition

The proximate composition of the feed was determined by Standard methods (AOAC, 1980).

Results and Discussion

Table 1 shows the growth performance of Tilapia hybrid (*Oreochromis niloticus* male x *Oreochromis aureus* female) fed at 1%, 3%, 5%, 8% and 10% body weight with 40% crude protein diet respectively in triplicate.

No significant difference was observed in the initial mean weight of the fingerlings. However significant differences were observed in the final mean weight of the fingerlings with treatment 1 recording the least final mean weight and treatment 5 recorded the highest final mean weight. The specific growth rate was lowest in DT 1 and increased in treatment with DT 5 recording the highest specific growth rate. Thus the growth rate of the hybrids increased with increasing feeding rate at 1%, 3%, 5%, 8% and 10% of the fish body weight.

Similarly, the Feed Conversion Ratio (FCR) followed a similar trend with the Specific Growth Rate (SGR). The best FCR was obtained in DT 1 while the poorest was observed in DT 5.

When the quantity of feed fed was matched with the estimated cost of the feed for each treatment (Table 2), it was observed that fingerlings fed at 1% body weight resulted in 64.9% of the growth rate of fingerlings fed at 10% body weight at the feed cost of 12.9%. Whereas fingerlings fed 3% body weight gave 85% of the maximum growth rate at 23.1% of feed cost. Similarly, fingerlings fed 5% body weight attained 88.5% of the growth rate of the 10% body weight at 52.7% cost.

The 8% feeding rate gave 92.7% of the growth rate at 87.2% cost. Although fingerlings fed the 10% body weight gave the highest growth rate the cost of the feed was very high at N19.46 compared to N2.51 for the 1% fed. The 3%, 5% and 8% feed were priced at N4.49, N10.25 and N16.97 respectively.

A wide variety of feeding rates have been used by scientists in feeding trials involving fish. Swingle (1967) recommended a feeding rate of 3% body weight adjusted bi-monthly. Campbell (1980) working with pelleted feeds fed. *O. niloticus* in cages at 8% body weight until the fish were 200g after which the feeding rate was reduced to 2% of body weight. Balarin reported 5% body weight as the best for tilapia.

In this study, the 1% body weight which had the least FCR was not recommended because of the low percentage growth rate (64.9%). rather, a feeding rate of 3% body weight was recommended inspite of the higher FCR compared to the 1% as this will give 85.1% growth rate at only 23.1% of the cost of the 10% body weight ration. This result agrees with the findings of Swingle (1967).

Table 1: Growth performance of Tilapia hybrid fingerlings fed 40% crude protein diet at different feeding rates for 56 days.

	DT1	DT 2	DT 3	DT 4	DT 5
Initial mean weight (g)	0.47 ^a	0.47 ^a	0.46 ^a	0.47 ^a	0.47 ^a
Final mean weight (g)	1.82 ^a	2.24 ^b	2.30 ^c	2.39 ^c	2.55 ^d
Weight gain (%)	287.2	376.5	391.5	408.5	442.6
Specific growth rate (SGR)	2.42	2.79	2.87	2.90	3.02
Feed conversion ratio (FCR)	1.38	2.45	5.38	8.54	9.04
Protein efficiency ratio (PER)	0.45	0.25	0.12	0.07	0.07
% Survival	94.4	64.4	83.3	91.1	74.4

Table 2: Economic Value of Feed Per Treatment.

Treatment	Mean wt. gain (g)	Qty of feed fed (g)	Price of feed (₦)	Estimated % of maximum growth
1	1%	1.35	1.86	2.51
2	3%	1.77	4.34	4.49
3	5%	1.84	9.90	10.25
4	8%	1.92	16.4	16.97
5	10%	2.08	18.8	19.46
				100
				100

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