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COMPARISON OF GROWTH AND SURVIVAL OF TWO STRAINS OF *Oreochromis niloticus* (TREWAVAS) FED WITH METHYLTESTOSTERONE TREATED DIET

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ABSTRACT

Growth and survival rates in two strains of *oreochromis niloticus* (strain A = Grey tilapia and strain B = Red tilapia) were compared when fry were fed with diets treated with the androgen 17 – α – Methyltestosterone at 60mg /kg feed for eight weeks. Growth performance was significantly different ($P < 0.05$) between treated and untreated fish while survival rate yielded no significant difference. The mean weights of strain A at the end of the experiment were 1.82g and 0.96g for treated and untreated fish respectively, while the corresponding result with respect to weight gain for strain B was 2.72g and 1.12g for treated and untreated fish respectively. Mean length of strain A were 3.39cm and 2.87cm for treated and untreated fish, while strain B recorded mean length of 5.29cm and 2.67cm for treated and untreated groups respectively. The mean percentage survival values of strain B were 92% and 97% for treated and untreated groups, while strain A recorded 90% and 89.33% for treated and untreated fish respectively. Survival rates between treated and control fish were not significantly different ($P < 0.05$).

Key Words: *Oreochromis niloticus*, Androgen, Somatic Growth, Methyltestosterone

INTRODUCTION

The tilapia, *Oreochromis niloticus* possesses a number of attributes which make it suitable for culture in diverse environments. It is about the fastest growing tilapia and as such the most widely cultured and most successful tilapia species (Guerrero 1975, Lahav 1993. It grows well on a wide range of foods (Wohlfarth and Hulata 1981, Mires 1983, Lahav 1993). Its high palatability and absence of intramuscular bones has earned it a high market value as an excellent table fish. It is therefore one of the worlds most important warm water cultured fish (Aguilar and Nath 1998).

However, a major setback in the culture of *O. niloticus* is its over prolificity and attendant overcrowding and stunted growth. According to Lahav (1993), *O. niloticus* breeds throughout under favourable culture conditions. Several methods, including sex reversal have been employed to circumvent the consequent stuntedness of tilapia resulting from its high fecundity. Hormonally induced sex reversal of tilapia, while a proven success has the added advantage of stimulating growth and food utilization in treated fish (Lahav, 1993, Ando et al 1986).

The occurrence of the red variety of *O. niloticus* among the cultured populations of tillapia in Israel in the early 1980s (Sarig 1987), from where it has spread to other parts of the world including Nigeria, is an interesting event worthy of investigation in the way of comparative studies on growth, survival, hardiness and general tolerance to environmental conditions vis-à-vis the normal grey coloured strain of the species.

MATERIALS AND METHOD

Broodfish from both strains of *O. niloticus* (Strain A = grey tilapia; strain B = red tilapia) were selected and

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acclimatized in 9600 litre concrete tanks for 10 days and were fed with a locally formulated fish meal based diet. Five females and four males of each strain, each weighing 200g were hypophysed according to the method of Woynarovich and Horvath (1980), to ensure that fry from the two strains were approximately the same size. Injected fish were allowed to spawn in 1800 litre concrete asbestos tanks maintained at 25°C.

Fifty 12 – day old fry were collected from the spawning tanks into plastic tanks (35 litres each) which were linked to the continuous flow system at a flow rate of 16.67 ml per second. The tank system consisted of two controls, CA and CB for the original and farm – derived strains respectively, and two tanks for strain A and strain B in which the hormone was administered. Both the control and test tanks had two replicates each.

The hormone, 17–α – Methyltestosterone which was bought from the chemist shop was incorporated in the fry feed using the Guerrero (1975) method. Sixty milligrams of the hormone was ground thoroughly, dissolved in 20% alcohol and handmixed with the fry diet. The fry diet, whose composition is given in table 1 is a commercial fry feed obtained from the Rockwater fish farm Jos, Nigeria. The amino acid, methionine, was added separately in the experimental diet. This is because methionine is the first limiting amino acid in Soya bean, and has therefore been recommended as a separate addition in feeds containing Soya bean (Halver 1980).

Table 1: Composition of the experimental feed.

Component	Percentage in diet
Maize	10
Soya Bean	15
Fish meal	30
Yeast	10
Methionine	2
Vitamin Pre-mix	3
Shrimp Meal	30
Total	**100**

Weekly measurements of length and weight were made in each tank. Length was measured by placing fry in a calibrated petri dish while weight was measured by the Burrows (1951) displacement method. The mean increase in length and weight was calculated from the weekly measurements of length and weight during the eight-week period. Mortalities were recorded on a daily basis. Proximate analysis was carried out for crude protein, lipid content, ash and moisture content for both the experimental feed and the fish at the beginning and at the end of the experiment.

The specific growth rates, food conversion efficiency and protein efficiency ratio for the fish were calculated using the formulae given by Jauncey (1982).

DATA ANALYSIS

Data were analyzed using a one-way Analysis of variance (ANOVA). Correlation coefficient (r) was also employed to evaluate the relationship between fish length and weight.

RESULTS

Proximate Composition of Fish.

Data on proximate analysis of the fish showed that strain A control group (CA) recorded an increase in crude protein from 82.7g to 84.5g, crude fat increased from 21. 4g to 23.2g, ash increased from 0.0182g to 1.05g, while moisture content decreased from 1.298g to 1.06.

Similarly, fish from strain A treatment group (A) showed an increase in crude protein from 80.5g to 86.8g, crude fat increased from 22. 1g to 24.1g while moisture decreased from 1.24g to 0.57g.

In strain B control fish (CB) crude protein increased from 81.094g to 86.2g, crude fat increased from 23.03g to 23.63g, ash increased from 0.84g to 1.15g while moisture decreased from 0.84g to 0.63g. Strain B treated group (B) showed an increase in crude protein from 81.19g to 91.3g, crude fat increased slightly from 22.9g to 22.96g, ash increased from 0.018g to 0.57g while moisture content decrease significantly from 1.664g at the beginning of the experiment to 0.57g at the end of the experiment. All these results are given in table 2 below:

INCREASE IN LENGTH AND WEIGHT

The mean increase in length and weight during the eight – week period is shown in figures 1 and 2 respectively. Fish in all groups showed a gradual increase in both length and weight. In the eight-week period control fish (CA) belonging to strain A had the shortest mean length of 2.87cm while strain B treated fish (B) had the highest mean length of 5.29cm. Strain A treated fish (A) and strain B control group (CB) had nearly the same mean length of 3.893cm and 3.67cm respectively. Similarly, strain A control fish (CA) had the highest mean weight of 2.724g, while values of mean weight for strain A treated and strain B control fish were 1.82g and 1.12g respectively.

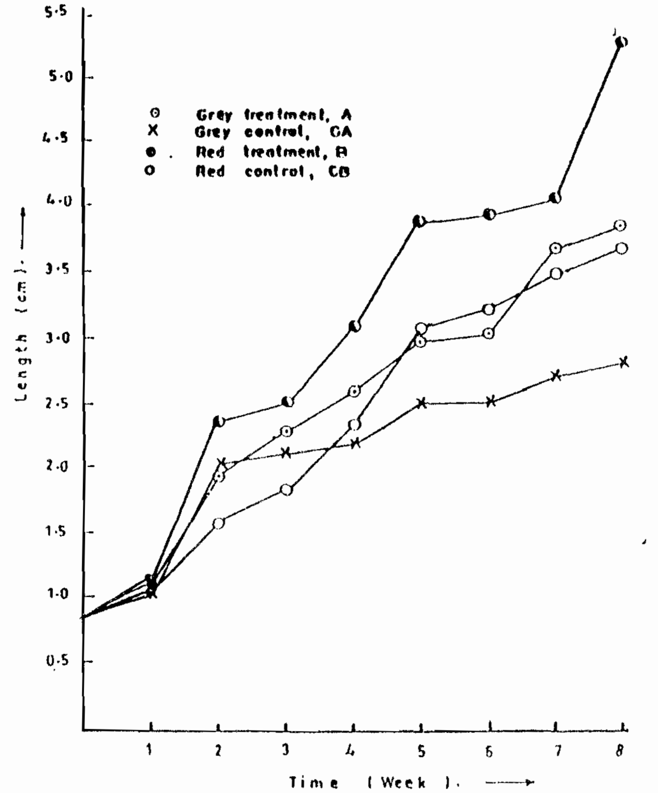

Fig. 1 : Relationship between average fish length and time

Analysis of variance (ANOVA) showed significant differences (P<0.05) in length and weight increase between treated and control groups. Correlation coefficient (r) showed a significant positive correlation (df 7, p = 0.05) between increase in length and weight for all groups throughout the eight – week period.

Table 2: Proximate composition of the fish at beginning and at end of experiment and that of feed.

Treatments **Components**

Treatments	Mean wt(g)		Crude Protein (g)		Crude fat (g)		Ash (g)		Moisture (g)	
	W_1	W_2	P_1	P_2	C_1	C_2	A_1	A_2	M_1	M_2
CA	0.05	0.96	82.7	84.5	21.4	23.2	0.02	1.05	1.30	1.06
A	0.05	1.13	80.5	86.8	22.2	24.1	0.02	1.19	1.24	0.99
CB	0.05	1.22	81.1	86.2	23.0	23.6	0.02	1.15	1.46	0.85
B	0.06	2.72	81.9	91.3	22.9	23.0	0.02	1.36	1.64	0.57
Feed	50		39.50		21.20		13.54		10.30	

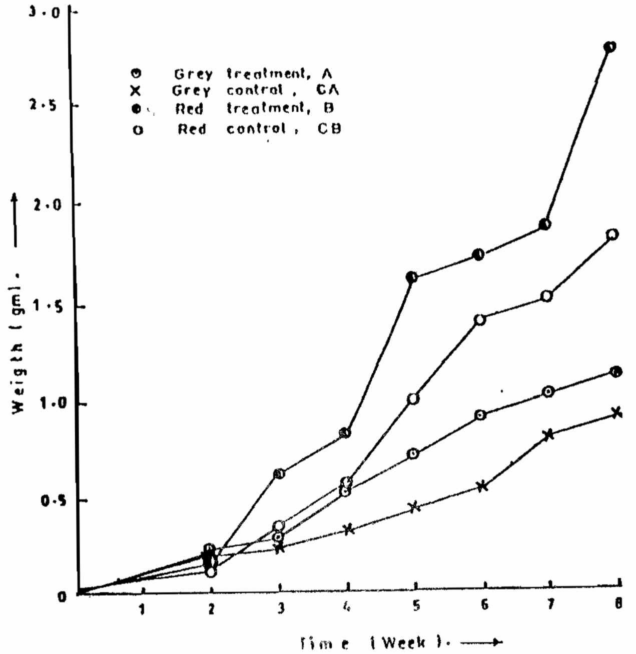

Fig. 2 : Relationship between average fish weight and time.

Specific Growth Rate (SGR)

Specific growth rate (SGR % day) values for both length and weight in all the fish are given in table 4 Treated fish belonging to strain B had the highest SGR values of 3.12%/day for length and 1.45% day for weight. Strain A control fish (CA) had the lowest values of SGR, with 2.28% day for length and 0.98%/ day for weight. Food conversion efficiency (FCE) value for each treatment are given in table 5. Strain A control fish had a mean FCE of 0.84 while their treated counterparts had mean FCE of 0.051. Strain B control and treated fish had mean FCE values of 0.108 and 0.28 respectively. Protein Efficiency Ratio (PER) values were 1.902 and 2.776 for strain A control and treated fish respectively, while the corresponding values for strain B were 2.366 and 5.379 for controls and treatments respectively.

Survival Rate

The mean percentage survival for strain A control and treated fish were 89.33% and 90% respectively, while strain B control and treated fish had 97.33% and 29% respectively.

DISCUSSION

Generally, treated fish from both strains had a higher increase in length and weight than the controls. Strain B treated fish had the highest mean values of both length and weight at the termination of the experiments, higher than those for strain A treated group (table 3). This shows that strain B, the red tilapia exhibited a much greater response to the hormone treatment than the grey tilapia (Strain A). These growth rates are in agreement with previous works on both strains of *O. niloticus* carried out by Galman and Avtalion (1983) and Berger and Rothbard (1987). The general growth pattern was similar in both strains as shown in figures 1 and 2.

The treated fish from both strains showed better proximate composition than untreated fish (table 2). These values were superior in the red tilapia, indicating a higher somatic growth.

The red tilapia showed a significantly

Table 3: Specific Growth rates (Length and Weight), Food conversion Efficiency and percentage survival in Oreochromis niloticus at 25°C.

Treatments	Mean Length (cm)		Mean Weight (g)		SGR Replicates						FCE	% Survival
					Length			Weight				
	L1	L2	w1	w2	1	2	3	1	2	3		
CA	0.81	2.80	0.05	0.963	2.29	2.76	2.27	0.96	0.97	0.99	0.84	89.33
A	0.81	3.23	0.05	1.82	2.48	2.[illegible]4	2.41	1.03	1.29	1.10	1.151	90
CB	0.80	2.89	0.049	1.12	2.34	2.39	2.55	1.09	1.21	1.09	0.108	97
B	0.82	5.29	0.06	2.72	3.064	3.14	3.14	1.48	1.47	1.40	0.280	92

higher ($p < 0.05$) response to the anabolic steroid 17 – α – MT than the grey tilapia as is evident in the significantly higher ($P < 0.05$) increase in crude protein, crude fat and ash content. Anabolic steriods have been shown to increase growth and food utilization in fish (Mires 1983, Matty 1985).

Moisture content on the other hand followed a general pattern of reduction in all fish but more significantly ($P < 0.05$) in treated fish. Strain B treated fish had the highest reduction in moisture content (reduced by 1.069g), while strain A control fish had moisture content reduced by 0.23g. According to Jauncey (1982), Viola and Arieli (1983a) and Omoregie and Ogbemudia (1993), reduction in moisture content is complemented by increase in protein content.

There was also a significant positive correlation (df 7, $p = 0.05$) between increase in length and weight during the treatment period.

The specific growth rate (SGR %/day), food conversion efficiency (FCE) and protein efficiency ratio (PER) were all higher in the hormone treated fish than in the controls. Furthermore, strain B (red tilapia) treated fish had higher values of these parameters than the strain A (grey tilapia) treated fish. These results indicate that the red tilapia's superior growth rate is attributable to its being a farm–derived strain (Sarig 1987). Being a mutant strain, it probably has certain inherent characteristics in its genetic structure that readily promote fast growth particularly in the presence of a catalyst such as an anabolic steroid.

Based on the results of this study, work on the genetic structure of the red tilapia, which gives it an advantage over the grey tilapia in terms of growth and food utilization should be pursued.

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