THE POTENTIAL OF CAMEL TESTICLES FOR THE GROWTH AND SURVIVAL OF MASCULINIZED NILE TILAPIA (*Oreochromisniloticus*, LINNEEUS 1758)

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Abstract: The potential of camel testicles for the growth and survival of masculinized Nile Tilapia (*Oreochromisniloticus*) was carried out in the Department of Fisheries University of Maiduguri. The aim was to assess the potentials of camel testicles on growth and survival of masculinized *Oreochromisniloticus*. Fresh testicles from camel were collected from Maiduguri abattoir and convey to the Fish Hatchery Complex of the Department of Fisheries, University of Maiduguri. The testicles were incorporated into the fish diet at various concentrations of (0, 25, 50, 75 and 100%) and the fish reared for 40 days in replications indoors. They were further reared for another 90 days on 25% crude protein normal diet for easy identification of male and female. Ten males from each replication were selected and reared for three months for growth performance. Fries treated 100% camel testicle reveals higher growth performance and survival rate. Therefore, camel testicle can be effectively used to enhance growth and nutrient utilization and can be as protein source for *Oreochromisniloticus*.

Keywords: Camel, growth, masculization,*Oreochromisniloticus*, potential, survival, testicles

Introduction

To economically produce a healthy high quality fish, good nutrition is an essential factor of consideration. In fish farming, nutrition is critical because feed represents 40 – 60% of the production costs. Fish nutrition has advanced dramatically in recent years with the development of new balanced commercial diets that promote optimal fish growth and health (Sahu*et al.*, (2007). Nile tilapia that is native to Africa and Middle East has emerged from mere obscurity to one of the most productive and internationally traded food fish in the world (Gupta and Acosta, 2004). Farmed tilapia production throughout the world increased dramatically in recent years, from 383,654 mt in 1990 to 2,326, 413 mt in 2006 (FAO, 2007). As a result of their faster growth rate, tolerance to harsh environment and ease culture technique, Nile tilapia offers the possibility of commercial and home grown protein sources where wild capture fisheries are been depleted (Mandal*et al.*, 2009).

Oreochromisniloticus are naturally occurring in African coastal rivers (Trewavas and Teugels, 1991), Nile basin (including Lake Albert, Edward and Tana) in Uganda, Lake Kivu, Lake Tanganyika, Awash River in Congo Kinshasa, in Ethiopion Lakes, Omo River system Lake Turkana, Suguta River, and Lake Baringo (Trewavas, 1983). In West Africa, natural distribution covers the basins of Senegal, Gambia, Volta, Niger, and Chad with introduced specimens from various coastal basins (Teugels and Thys van den-Audenaerde, 2003). In Nigeria, they are found in Lake Chad, river Niger, and Benue, Ero reservoir in Ekiti and Opa reservoir at Ile-Ife (Komolafe and Arawomo, 1998). *Oreochromisniloticus* lives in wide variety of fresh water habitat like rivers, lakes, sewage canals, and irrigation channels (Bailey, 1994). They are mainly diurnal feeding on phytoplankton and benthic algae (Breder and Rosen, 1966). They survive at extended temperature range 22 - 42ºC and natural temperature range 28 - 33ºC (Philippart and Ruwet, 1982).

A camel is even-toed ungulates within the family camelidae and genus camelus, bearing distinctive fatty deposits known as “humps” on the back. The two surviving species of camel are the dromedary, or one humped camel (*C. dromedarius*), which inhabits the Middle East and the Horn of Africa; Sahel, Maghreb and South Asia. The horn region has the highest concentration of the camel in the world (Ramet *et al*., 2011). Bacterian or two humped camel (*C. bacterianus*) which inhabits central Asia and both species have been domesticated. Camels provide milk, meat, hair for textile or goods such as felted pouches and are working animal with tasks ranging from human transport to bearing loads (Ramet *et al*., 2011).

Several animal materials have been used as an animal protein for *Oreochromisniloticus.*Fashina-Bombata and Somotum (2008) in a comparative study of *Oreochromisniloticus* fed coppens and goat testes for 40 day outdoors indicated fast growth (5.7g) in fish fed goat testes meal. Phelps *et al*. (1996) reported good growth performance of sex-reversed Nile tilapia fed goat testes at ratio 3:1 testes to feed. Fashina-Bombata and Somotum (2008) found that fish fed goat testes meal grew faster than those fed commercial diet. Haylor and Pascaul (1991) fed *Oreochromisniloticus* with ram testes meal and reported growth in fish. Growth suppression was reported on *Lebistes reticulates* fed pregnesninolone. The animal materials used are not sustainable and in some cases competing with human consumption and there by rendering it to be costly. The use of camel testes as a protein source for *Oreochromisniloticus* had not been utilized and hence the choice for the research.

Materials and Methods

Study area

The experiment was conducted at the Teaching and Research Fish Farm of the Department of Fisheries, University of Maiduguri situated between latitude 11º51^{1} N and longitude 13º05^{1} E.

Experimental diet preparation

Forty percent (40%) crude protein diet was formulated using some fish feed ingredients (Table 1). The ingredients were procured from a local market in Maiduguri. They were processed and ground separately into powder using hammer miller. The formulated diet were analysed for their proximate composition (Table 2) according to the method described by AOAC (1999)

Collection and preparation of camel testes

Fresh testes from matured camel were obtained from Maiduguri abattoir. The testes were conveyed to fish hatchery complex of the Department of Fisheries, University of Maiduguri where they were dried and ground to powder before incorporated in to the experimental diet.

Table 1: Experimental diet before testes inclusion level

Feed ingredients	Testes inclusion level (%)				
	0	25	50	75	100
Fish meal	23.20	23.20	23.20	23.20	23.20
Soybean meal	23.20	23.20	23.20	23.20	23.20
G/nut cake	23.20	23.20	23.20	23.20	23.20
Maize	12.17	12.17	12.17	12.17	12.17
Wheat bran	12.17	12.17	12.17	12.17	12.17
Bone meal	2.00	2.00	2.00	2.00	2.00
Premix	0.47	0.47	0.47	0.47	0.47
Salt	0.33	0.33	0.33	0.33	0.33
Lysine	1.73	1.73	1.73	1.73	1.73
Methionine	1.27	1.27	1.27	1.27	1.27
Total	100	100	100	100	100

Table 2: Proximate composition of Camel testes based diet

Nutrients (%)	Testes inclusion level (%)				
	0	25	50	75	100
C/protein	42.00	43.80	51.20	56.60	22.00
C/protein	42.00	43.80	51.20	56.60	22.00
Moisture	4.98	9.27	15.20	19.94	10.01
Ether extract	4.97	4.80	4.50	4.60	3.98
Crude fibre	4.16	4.28	4.57	4.62	3.39
Crude fat	4.17	5.39	7.18	7.57	14.70
Ash	5.54	6.17	6.56	7.01	6.11

Experimental fish

The fry for the experiments were produced by stocking twenty four (24) matured females and eight (8) males of *Oreochromisniloticus*brood stocks of four months of age (150 – 300 g) at a ratio of 3:1 Female: male. The broodstock were fed 25% crude protein normal diets two times daily, morning and afternoon (9am and 3pm, respectively local time). The bloodstocks were closely monitored daily as from one week of stocking for free swimming fries

Experimental design

The dried ground testes were incorporated into the formulated powdered diet at the concentrations 0, 25, 50, 75 and 100% in replicates. Each treatment was stocked with 90 fries in 40 litres capacity plastic trough filled with 30 litres of water in a complete randomised design manner (CRD). The fish were fed with various concentrations of the camel testes based diet for the period of 40 days indoors. At the end of the 40 days indoor rearing, they were moved to outdoor and reared for 90 days on normal diet (25% CP) for easy identification of their sex.

Growth indices

At the end of the 90 days outdoor rearing, ten males were selected from each replication and reared for three months on the normal diet of 25% CP. At the end of the three months culture, the following growth data were recorded; final weight (g) length (mm), survival rate and quantity of feed consumed. The following growth indices were estimated for each of the treatment using the formulae;

i) Weight gain (g) = $W_2 – W_1$, where $W_2$and $W_1$are the final and initial weight of fish, respectively.
ii) Mean Daily weight gain (MDWG**)** in gram = $W_2 – W_1 \div N \times t$
iii) Final length (mm) = $L_2 – L_1$where $L_2$and $L_1$are the final and initial length of fish, respectively
iv) Specific growth rate (SGR) in % per day = $\log_e W_i - \log_e W_o \div t \times 100$
v) Feed conversion ratio (FCR)= dry weight of feed (g) ÷ weight gain of fish (g).
vi) Condition factor (K) = $W \div L^3 \times 100$, where W is the weight of fish while L is the length of fish in mm
vii) Percentage survival = $N_2 – N_1 \div t \times 100$, where $N_2$and $N_1$are the final and initial numbers of fish, respectively; t= the culture period (Ayoola*et al*., 2012).

Data analysis

Data obtained from the study were subjected to one-way analysis of variance. The differences between means were determined using Fisher's LSD (p = 0.05)

Results and Discussion

Table 3 shows the growth performance of *Oreochromisniloticus* masculinised with (CTD). The highest mean final weight (68.33 g) was obtained in fries treated using 100% CTD followed by 57.20 g for fries treated 25%. Fries treated 0 and 75% CTD recorded 56.87 and 54.00 g while the lowest (51.03 g) was recorded was obtained in fries treated 50% CTD. Only fries treated 100% of the camel testicles differed statistically ($p < 0.05$) among all other treatments (0, 25, 50 and 100%). Mean final weight recorded in this study was lower than 660 g reported by Phelp*et al*. (1996) after treating same species with 1:3 of the RTD. The highest mean weight gain (35.80 g) was obtained in fries treated 100% of the CTD followed by 25, 0, 75 and 50% CTD with values of 32.47, 31.83, 30.67 and 28.97 g, respectively. Fries treated 100% CTD shows significant variation ($p < 0.05$) compare to those treated 0, 25, and 75% CTD. The mean weight gain (35.80 g) obtained in this study was higher than the one reported by Ndirmbita (2013) who reported 0.56 g after treating *Oreochromisniloticus*at ratio 1:1 feed/testes for sex reversal. These differences may be due variation in the animal gonads used for the experiment.

Table 3: Growth performance of Masculinised *Oreochromisniloticus* using Camel testicles

Parameters	Camel testicles inclusion level (%)					SEM
	0	25	50	75	100	
IW (g)	25.03^{b}	21.53^{b}	28.23^{b}	20.03^{b}	42.53^{a}	5.30*
WG (g)	31.83^{a}	32.47^{a}	28.97^{ab}	30.67^{a}	35.80^{b}	4.53*
FW (g)	56.87^{b}	57.20^{b}	51.03^{b}	54.00^{b}	68.33^{a}	2.53*
FTL (mm)	488.67^{a}	492.20^{a}	476.67^{a}	494.20^{a}	486.63^{a}	22.17^{NS}
SR (%)	100.00^{a}	90.33^{b}	100.00^{a}	90.67^{ab}	100.00^{a}	3.00*
CF	3.37^{b}	3.27^{b}	3.21^{ab}	3.13^{b}	3.11^{a}	0.52*
SGR(%/day)	1.36^{a}	1.39^{a}	1.31^{ab}	1.38^{a}	1.23^{b}	0.08*
PER	0.62^{a}	0.64^{a}	0.57^{a}	0.61^{a}	0.47^{b}	0.04*
FCR	2.59^{ab}	2.89^{ab}	2.44^{b}	2.94^{a}	2.40^{b}	0.23*

SEM = Standard error of means; a, b, c = Means within the same row with different superscripts differ significantly ($p > 0.05$); FW = Final weight; WG = Weight gain; FTL = Final total length; SR = Survival rate; CF = Condition factor; SGR = Specific growth rate; FCR = Food conversion ratio

Final length (494.20 mm) was recorded in fries treated 75% of CTD. The values of 492.20, 488.57 and 486.63 mm were noticed in fries treated 25, 0 and 100% CTD while samples treated with the lowest value of 476.67 mm. No significant variation ($p > 0.05$) was observed among the treatments (0, 25, 50, 75 and 100%). Higher value (494.20 mm) obtained as a final total length was greater than the one reported by Sikoki and Egwu (2000) which is 5.29 cm after treating *Tilapia zilli* with 17α-methyltestosterone at 60 mg/kg for 8 weeks. The higher percentage obtained may be due to differences in the species and gonad used in the two experiments. Higher survival rate of 100% was at 0, 50 and 100% with CTD while the lower value (90.33) was in fry treated 25% of the CTD.

Significant variation ($p < 0.05$) was observed only in fish treated 25% of the CTD than those treated with 0, 50, 75 and 100% of the CTD. The 100% survival rate recorded in this experiment was higher than the 70% reported by Abdel-Tawwab*et al*. (2005) after treating *Oreochromisniloticus* with 60 mg/kg of 17α-methyltestosterone for 28 days. The lower survival rate recorded might be due to unfavorable

environmental factors. Higher condition factor (3.37) was observed in fish treated 0% of the camel testicles experimental diet followed by fries treated 25, 50, 75 and 100% CTD (3.27, 3.21, 3.13 and 3.11, respectively). Treated fries with 75 and 100% CTD differed significantly ($p<0.05$) with fries treated 0 and 25% of the CTD. The value of condition factor reported in this study (3.37) was higher than the one obtained by Ndirmbita (2013) 2.07. This indicates that the fish were in good condition during the experiment. The highest specific growth rate (1.39%) was obtained in fries treated 25% CTD followed by 1.38, 1.36, 1.31 and 1.23% in fries treated with 75, 0, 50 and 100%, respectively of the CTD. Fries treated with 100% shows significant variation ($p < 0.05$) in the fries treated 0, 25 and 75% CTD than in 50% treated fires with CTD. The higher specific growth rate of 1.39% recorded in the current study differ significantly with the finding of Hassan *et al*. (2012) that reported 0.80% after feeding Nile tilapia with dried bull testes incorporated with local feed.

The differences in the results might be contributed by duration, location, feed intake and season of the experiment. Higher food conversion ratio value of 2.40 was obtained in fry treated 100% of the CTD. Fries treated 50% of CTD recorded the value of 2.44 while the lowest was seen in fry treated with 75% CTD with a value of 2.94. No significant variation ($p> 0.05$) was seen in fries treated 0, 25, 50 and 100% CTD but they differed ($p<0.05$) with fries treated 75% CTD. The higher food conversion ratio presented in this study was lower than the one produce by Siddiqui*et al*. (1991) who obtained 2.3 for tilapia treated with synthetic hormone for 28 days. The protein efficiency ratio was higher 0.64 in treatment 2 (25% CTD) followed by the control (0% CTD) with the value of 0.62. Treatment 5 (100% CTD) reveals the lowest value of 0.47. Only those fries treated 100% CTD vary statistically ($p<0.05$) with the other treatments (0, 25, 50 and 75% CTD).

Conclusion

From the result of this experiment, fries treated 100% camel testicle reveals higher growth performance and survival rate. Therefore, camel testicle can be effectively used to enhance growth and nutrient utilization and can be used as protein source for *Oreochromisniloticus*.

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