GROWTH ENHANCEMENT POTENTIAL OF *Mucuna pruriens utilis* ON THE NILE TILAPIA *Oreochromis niloticus* (L.)

[1] KOMI, G.W., [1] SIKOKI, F.D., [1]ALELEYE-WOKOMA, I.P. AND [2]BEKIBELE, D.O.

[1]. Department of Animal and Environmental Biology, University of Port Harcourt, Port Harcourt.

[2]. African Regional Aquaculture Centre, Aluu/ Nigerian Institute for Oceanography and Marine Research, Port Harcourt.

ABSTRACT

The growth enhancement potential of *Mucuna pruriens utilis* on the Nile Tilapia, *Oreochromis niloticus* (L.), was investigated in eight weeks feeding trials in concrete tanks at the African Regional Aquaculture Centre, Aluu. Three isonitrogenous diets were fed to three sets of fingerlings of the fish with full fat soya bean diet(D1) serving as the Control. The initial average Fish weight was 1.45±0.12 and the final average fish weight was 5.67±1.46. Crude protein, ash and nitrogen free extract of the carcasses were significantly different (P>0.05) from the control specimens. The average weight gains were 3.85g, 3.54g and 3.42g for fish fed "full fat" Soya bean based diet(Control), fermented *Mucuna* seed diet(D2) and unfermented *Mucuna* seed diets (D3) respectively. Average apparent food consumed was in the order D2 >D1 > D3. Fish fed fermented *Mucuna* seed diet (D2) had the highest food conversion ratio of 1.51 followed by fish fed with the control diet (D1) 1.22 and fish fed unfermented *Mucuna* seed diets (D3) 1.19. Unfermented *Mucuna* seed diet had the highest food conversion efficiency (0.84) followed by full fat Soya bean based diet(Control) 0.82 and the least was the fermented *Mucuna* seed diet (0.66). The results of this study indicate that unfermented *Mucuna* diet can conveniently replace Soya bean based diet without significantly affecting growth.

Key Words: Feeding potential, Processing, Concrate tanks, weight gained

INTRODUCTION

Mucuna pruriens utilis, an underutilized tropical legume has a nutritional quality comparable to Soya bean and other conventional legumes as it contains similar proportions of protein, lipids, minerals and other nutrients. *Mucuna* is a fast growing annual which enhances soil fertility, protection and weed suppression (Carsky *et al.*, 1998). *Mucuna pruriens utilis* although underutilized has good nutritional value, but contains anti-nutritional factors (Betancur-Ancona *et al,* 2008). Its grains are eaten by Cattle, Sheep and Pigs (Kay 1979). Osuigwe (2003) reported that Raw and boiled Mucuna Seed Meal used in the diets of *Heterobranchus longifilis* fingerling had a comparable performance with fishmeal based diet.

MATERIALS AND METHODS

The use of fermented and unfermented *Mucuna* (*Mucuna pruriens utilis*) diet as feed supplements in the culture of The Nile Tilapia *Oreochromis niloticus.* was carried out at the family testing unit at African Regional Aquaculture Centre, Aluu, Port Harcourt.

Composition and Preparation of Diets

Full Fat Soya(Control diet) – Full fat Soya (prepared from soya bean) used for the experiment was obtained from African Regional Agriculture centre ARAC/NIOMR Aluu, Port Harcourt.

Fermented Mucuna Seed – Dry mature seed of *Mucuna pruriens var utilis* which was obtained from IITA Ibadan was soaked overnight, boiled for 45 minutes, ground and fermented for 48hrs using yeast. Thereafter dried in an oven at 60^{0}C.

Unfermented Mucuna Seed – Dry mature seed of *Mucuna pruriens var. utilis* was obtained from IITA Ibadan. The seed was soaked overnight, ground, dried and preserved in an air-tight plastic container for later use.

Other Ingredients – The other ingredients – wheat bran, fishmeal, garri, palm oil, premix, bone meal and vitamin C – used in the formulation were obtained from the ARAC/NIOMR feedmill.

Diet Formulation

Diet 1, 2 and 3 being full fat Soya, fermented Mucuna seed and unfermented Mucuna seed diets respectively were formulated with DI (full fat Soya) as control. Sixty-five percent of Soya bean was replaced with *Mucuna* beans protein in both fermented and unfermented Mucuna beans diets. The diets were approximately isonitrogenous with the control.

Experimental Tanks

The feeding trials were carried out in 9 concrete tanks each measuring 80 x 60 x 60 cm^3. Before stocking, the tanks were washed thoroughly and supplied with clean water from borehole known to be free of chlorine and planktons.

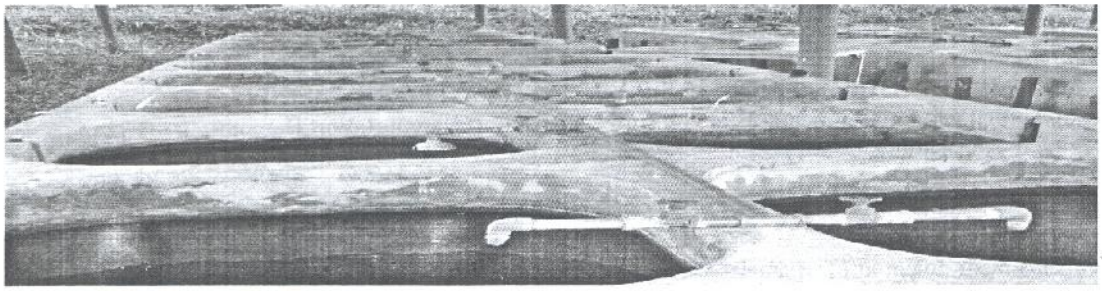

Fig. 3 Experimental Concrete tanks

Stocking

Each tank was stocked with 20 fingerling of hatchery bred *Oreochromis niloticus* with average body weight of 2.0g and average length of 4.6cm purchased from ARAC.

Fingerlings were starved for 24 hours before stocking and three tanks were assigned to each dietary treatment i.e. three replicates of three dietary treatments making up to 9 tanks in a completely randomized design.

Feeding of fish

The fish were fed their respective diets once daily, for a period of eight (8) weeks at a rate of 3% total body weight per day. They were fed between 11:00 – 12:00 hours when dissolved oxygen was high and food consumption at maximum.

Records of feed consumption, weight and length changes were progressively taken at two weeks (fortnightly) intervals. No feeding was done on Sundays and sampling days for convenience.

Measurement of the fish

Measurement of the fish weight and length were taken every fortnight to assess the growth rate. Each tank was drained completely. Total length and total wet weight of fish measured and weighed. After weighing, feeding rates were adjusted in accordance with changes in total wet body weight of fish.

Based on the length and weight changes over the feeding trial period, specific growth rate (SGR), Food Conversion Ratio (FCR), Food Efficiency, Protein efficiency ratio (PER), Daily growth rate (DGR) and percentage weight gain (PWG), were determined.

RESULTS AND DISCUSSION

Growth response of Nile Tilapia *Oreochromis nileticus*

The growth of Nile Tilapia *Oreochromis niloticus* was progressive with mean weight per fish ranging from 1.75 to 5.60 in D1, 2.13 to 5.67 in D2 and 1.45 – 4.87 for D3 in eight weeks. Mean length per fingerling of *Oreochromis niloticus* for D1 ranged from 4.63 to 6.87, D2 ranged from 5.00 to 7.13 and D3 from 4.30 to 6.57. For a trial period of 8 weeks average weight gained did not show any statistical significant difference ($P>0.05$) among the control diet DI, fermented *Mucuna* seed diet D2 and unfermented *Mucuna* seed diet D3. Percentage weight gained was also subjected to analysis of variance but did not show any significant difference ($P>0.05$) among treatments. This implies that the progression of weight gained was similar, and treatments have almost equal amount of energy.

The control Diet, D1 gave rise to the highest average weight gain (3.85) in the experimental fish followed by diet 2 (3.54) and D3 (3.42) being the least. When subjected to analysis of variance, there was no significant difference ($P>0.05$) among D1, D2 and D3.

Percentage weight gained though statistically, not significantly different among the three diets $P>0.05$, D3 showed the highest value (235.86) followed by D1 (220.00) and D2 (166.20).

Daily weight gained shows that fish fed with diet 2 gained more weight (0.099) on a daily basis than fish fed D1 (0.098) and D3 (0.085).

Food Conversion Ratio, Food Efficiency and Protein Efficiency Ratio.

Fish fed fermented mucuna seed diet D2 has food conversion ratio of 1.51 which is the highest in the array of 1.19, 1.22 and 1.51 for D3, D1 and D2 respectively. Food conversion ratio is however not statistically significant ($P>0.05$) among fish fed D1, D2 and D3.

Food efficiency is highest in diet D3 with value (0.84) and lowest in diet 2 with value 0.66. Soya bean based diet D1 which serves as control has 2.57 as protein efficiency ratio, D2 (1.63) and D3 (2.34). Protein efficiency ratio does not show statistically significant ($P>0.05$) difference among the three diets.

At the end of the feeding trials, the carcass quality was analyzed and the result (Table 1) shows that Fish protein was significantly different ($P<0.05$) in fish fed D2 and D3 but not significantly different ($P<0.05$) from fish fed with D1. Carcasses Ash, shows significant difference ($P<0.05$) among fish fed with D1, D2 and D3. Nitrogen free extract [N.F.E.] however was significantly different ($P< 0.05$) between D2 and D1, D2 and D3.

Table 1 % Nutrient composition of *Oreochromis niloticus* carcass as at the end of feeding trial

Parameters	D1 (Control)	D2	D3
Crude protein	51.04^{ab}±2.53	45.79^{b} ±7.85	54.69^{a} ±3.09
Ash	11.50^{b}±1.40	15.30^{a}±0.76	11.83^{b} ±1.72
Crude fibre	5.62+1.32	7.25±1.99	6.09±3.39
Moisture	6.33±0.30	8.86+2.00	6.83±1.58
Lipids	23.93±3.35	20.53±3.11	18.47±2.80
Carbohydrate (NFE)	1.58^{b}±0.35	2.19^{ab}±0.38	3.59^{a}+1.54

Values in the same row showing common superscript are not significantly (P>0.05) different.

Oreochromis niloticus accepts Soya bean base diet, fermented *Mucuna* seed diet and unfermented *Mucuna* seed diet appreciably over the eight weeks feeding trials. Growth parameters such as specific growth rate (SGR) average weight gain, daily weight gain and percentage weight gain did not show significant difference (P>0.05) among the treatment diets.

In terms of growth and nutrient utilization there was no significant difference (P>0.05). *Mucuna* bean based diets is as good as soya bean based diet. This agrees with the observations of Perumal and Klaus (2001) in their preliminary nutritional evaluation of *Mucuna* seed meal (*Mucuna pruriens* var. *utilis*), growth performance and feed utilization in common carp (*Cyprinus carpio*) that no significant differences were observed regarding the whole body moisture, protein, ash and lipid contents among fishes.

Carcass composition of *Oreochromis niloticus* show significant difference (P>0.05) in crude protein, ash and nitrogen free extract, but statistically no differences in crude fibre, moisture and lipids in fish carcasses fed D1, D2 and D3. Fermented Mucuna seed meal has FCR value of 1.51 hence fermentation improves food conversion of *Oreochromis niloticus*. In terms of fish quality, fish fed unfermented *Mucuna* diet (D3) is better than fish fed Soya bean meal because D3 leads to lower level of carcass lipids. The more lipids in fish the poorer the quality of the fish (Bekibele, 2005,Bekibele, 2007).

CONCLUSION

Feeding the Nile Tilapia *Oreochromis niloticus* with diets of full fat soya D1, fermented *Mucuna* D2 and unfermented *Mucuna* D3 did not give any significant difference.

Fermented and unfermented Mucuna bean diets can conveniently replace diets with full fat soya in the Nile Tilapia feed.

Carcass quality of Nile Tilapia fed with unfermented *Mucuna* bean diet D3 was better than those fed with diets of full fat soya D1 and fermented *Mucuna* diet D2 in terms of shelf life.

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