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Growth Responses of African catfish (*Clarias gariepinus*) fingerlings fed diets replacing Soyabean with Acacia Seed (*Cassia fistula*)

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ABSTRACT: This study determined the growth response of *Clarias* gariepinus fingerlings fed ground toasted *Cassia fistula* (CF) seed. Partial replacement of soyabean in the diet with varying levels of *Cassia fistula* seed meal at 0%, 10%, 20%, 30%, 40% and 50% were carried out for 70 days. The fishes were fed twice daily to satiation. One hundred and twenty-six (126) fingerlings with an initial mean weight of 1.68±0.76 g were allotted at random to aquaria tanks of 25 L size. A total of 18 tanks was used with each tank containing seven fishes. Each of the six treatments was randomly allocated to three tanks as replicate. The six treatments (diets) were isocaloric and isonitrogenous containing 40% CP. The highest mean weight gains of 0.25 g was recorded in Treatment 3 and Treatment 4, they were not significantly different (P>0.05) from other treatments. The highest feed intake value (1.33 g) was recorded in Treatment 3 while the least value of feed intake (1.02 g) was recorded in the control diet. Survival among treatments slightly varied significantly (P<0.05) with treatments of 20%, 30% and 50% *Cassia fistula* diet having higher survival rates.

Keywords: Acasia, *Cassia fistula*, catfish feed, Nutrition.

Introduction

Fish supply is from four major sources viz., artisanal fisheries, industrial trawlers, aquaculture and imported frozen fish (Akinrotimi *et al.*, 2011). As the need to augment production from the wild heightens due to increasing demand for fish, there is increased global attention on aquaculture (Owodeinde *et al.,* 2010). According to El-Saidy and Gaber (2003); Siddhuraju and Becker (2003); Wu *et al.* (2004), aquaculture has become the fastest-growing food production sector in which fish meal is a primary protein source in fish diets. In aquaculture, feeding of culture fish is one of the most important factors that must be considered.

Commercial fish feeds are usually expensive, because the traditional or conventional fish feed ingredients such as fishmeal, soybean, groundnut among others were used for both human and livestock consumption (Madu *et al.,* 2003). Aliu and Ofoche (2001) reported that the high cost of conventional feed stuffs underscores the need to develop adequate but relatively inexpensive feed formulation from the readily available material.

Many unconventional sources have good nutrient profile which when incorporated into feeds are able to meet parts of the protein and energy requirements of fish. Siddhuraju and Becker (2002) reported that the grain legume have not been extensively used in fish feeds though they represent a good source of dietary protein and energy. Researchers have started to evaluate the acceptability of grain legume such as *Cassia fistula* (Adebayo *et al.,* 2004)

and feed pea (Borlongon *et al.,* 2003) among others. Not only are they rich in protein and carbohydrates, they are also noncompetitive in terms of human consumption and their prices are relatively low.

Materials and Methods

Experimental diets: Fishmeal (Anchovy), soyabean seed, healthy Acacia seeds, bone meal and vitamin premix were bought from retail outlet in Benin City, Nigeria. The seeds of the Acacia seed were toasted on a well heated pot for twenty (20) minutes to minimize the effect of toxins and protein inhibitors. All ingredients were finely ground in a domestic blender. The resultant flour was subsequently passed through a 0.34 mm sieve in the Fisheries Departmental Laboratory in the University of Benin. After the addition of palm oil, each dietary component was thoroughly mixed to homogeneity. The constituent yellow corn meal in each diet was gelatinized (boiled in water) to serve as binder in the pelleted feed ingredients. The composition of the experimental diets is shown in Table 1

Table 1: Composition of the experimental diets

	TREATMENTS					
INGREDIENTS %Substitution	**DIET 1 0%**	**DIET2 10%**	**DIET3 20%**	**DIET4 30%**	**DIET5 40%**	**DIET6 50%**
Fishmeal (65.5% CP)	25.00	25.00	25.00	25.00	25.00	25.00
Soya bean (38.8% CP)	56.26	46.26	36.26	26.26	16.26	06.26
Cassia fistula	0.00	10.00	20.00	30.00	40.00	50.00
Maize (9.5% CP)	6.10	6.10	6.10	6.10	6.10	6.10
Bone meal	4.00	4.00	4.00	4.00	4.00	4.00
Palm oil	8.00	8.00	8.00	8.00	8.00	8.00
Vitamin E gel	0.04	0.04	0.04	0.04	0.04	0.04
Vitamin premix	0.60	0.60	0.60	0.60	0.60	0.60

Clarias gariepinus fingerlings with initial mean body weight of 1.68±0.76 g were obtained from outdoor fish tanks of the Department of Fisheries, University of Benin, Benin City and used for the study.

Feeding Trials: The experimental design consists of six (6) dietary treatments with three (3) replicates each laid out in a Complete Randomized Design. Diet 1 with 0% *Cassia fistula* inclusion served as control. The experiment was conducted in 18 aerated aquaria tank (38 X 28 X 28cm). Clariid catfish fingerlings from the same broodstocks were stocked randomly at seven (7) fingerlings per aquarium in 40 litres of domestic water in the laboratory of the University of Benin. The fingerlings were fed crumbled 2.0mm size pellet of experimental diets twice daily to satiation between 8.00-9.00 hrs and 15.00-16.00 hrs. Feeding was monitored for each unit to ensure that fishes were not underfed or overfed. Experimental units were cleaned daily while changing the total water, Weekly weight gain and feed consumption were monitored for 10 weeks.

Growth and Nutrient Utilization indices: Weights of fish and feed consumption were obtained at weekly intervals. From the fish weights and feed consumption, the following were determined:

Weight gain = $W_1 - W_0$ (g)

Relative Weight Gain (RWG%)= $(W1 - W0)/W0 \times 100$ (%)

Specific Growth Rate (SGR %)= $\frac{(\text{In W1} - \text{In W0})}{T} \times 100$ (%/week)

Where;

W_0: mean initial weight (g)

W_1: mean final weight (g)

T: time in 7 days between weightings

Feed conversion ratio (FCR) = $\frac{\text{feed intake (g)}}{\text{wet weight gain}}$ (g)

Protein efficiency ratio (PER) = $\frac{\text{weight gain}}{\text{protein intake}}$

Net protein utilization (NPU) = $\frac{BP1 - BP0}{CP} \times 100$

Where;
BP_0: Initial body protein content (g)
BP_1: Final body protein content (g)
CP: Protein intake (g)

Statistical analysis: The data on weight gain; feed conversion ratio and survival rates for the dietary treatments were analyzed using one-way ANOVA (Analysis of variance) using GENSTAT version 12 software. The differences in mean values were compared by Duncan Multiple range Test. All test were carried out at 5% probability level.

Results

The results of the growth performance and feed utilization of the catfish, *Clarias gariepinus* fingerlings fed experimental diets containing varying inclusion levels of *Cassia fistula* is shown in Table 2.

Table 2: Growth performance and feed utilization of *Clarias gariepinus* fingerlings

	TREATMENT						
Parameters	**I**	**II**	**III**	**IV**	**V**	**VI**	**SEM**
	0%	**10%**	**20%**	**30%**	**40%**	**50%**	
Average daily feed intake (g)	1.02^{c}	1.05^{c}	1.33^{a}	1.04^{c}	1.04^{c}	1.20^{b}	0.07
Mean daily weight gain (g)	0.20	0.19	0.25	0.22	0.25	0.22^{NS}	0.06
Protein efficiency ratio	5.10^{ab}	4.67^{b}	4.73^{b}	5.40^{ab}	6.03^{a}	4.47^{b}	1.25
Specific growth rate(%/week)	1.31^{d}	1.23^{d}	7.70^{a}	2.53^{c}	8.33^{a}	4.27^{b}	0.68
Feed conversion ratio	5.10^{c}	5.53^{d}	5.32^{c}	4.73^{b}	4.16^{a}	5.46^{d}	0.29
Survival rate (%)	68.86^{b}	71.43^{b}	76.41^{ab}	75.37^{ab}	83.81^{a}	75.24^{ab}	4.01

NB: Means with different alphabetic superscripts are significantly different (P<0.05). Horizontal comparison only

The average daily feed intake of fish fed *Cassia fistula* varied significantly (P<0.05) among treatments. Treatment III with 20% replacement level had the best feed intake of 1.33g while the least amount of feed intake was recorded in control diet.
The mean daily weight gain of fish fed *Cassia fistula* was not significantly different (P>0.05) among treatments. Treatment III and V with 20% and 40% replacement level respectively had the best mean daily weight gain of 0.25g while the least mean daily weight gain was recorded in treatment II with 10% replacement level. The Protein efficiency ratio of fish fed *Cassia fistula* varied significantly (P<0.05) among treatments. Treatment V with 40% replacement level had the best Protein efficiency ratio of 6.03, this was followed by treatment I and IV with 5.10 and 5.40 respectively while the least Protein efficiency ratio was recorded by treatment VI. The Feed conversion ratio of fish fed *Cassia fistula* varied significantly (P<0.05) among treatments. Treatment V with 40% replacement level had the most efficient feed conversion of 4.16, this was followed by fish fed 30% replacement level while fish fed 10% replacement level had the worst feed conversion ratio of 5.53 and was not significantly different (P>0.05) from fish fed 50% replacement level which was 5.46. The survival rate varied among treatments with treatment V having the best survival of 83.81% while mortality was highest in control diet. Treatment III, IV and VI were however not significantly different (P>0.05) from each other.

Discussion

In the tropics, the use of *Cassia fistula* in fish diets has only been experimented upon by Adebayo *et al.* (2004) on *Oreochromis niloticus*. Result from that study showed that higher percentage above 17% inclusion of *Cassia fistula*

led to growth depression. They attributed this finding to the presence of anti-nutrients such as phytin and haemagglutinin. However, this study on catfish (*Clarias gariepinus*) shows a contrasting result which indicated that higher percentage as high as 40% inclusion of *Cassia fistula* is the optimal level for growth and Protein efficiency ratio

The *Clarias gariepinus* fingerlings responded to the change in diet for all the treatments as observed by Aliu and Ofoche (2001) who reported that African catfishes (*Clarias gariepinus* and *Heterobranchus bidorsalis)* are important tropical fish that readily accept prepared feeds from fry stage to adult size in culture system. Treatment V with 40% replacement level of *Cassia fistula* had the most efficient feed conversion of 4.16, which was similar to the result obtained by Bekibele, (2005). Growth performance and nutrient utilization of *Clarias gariepinus* fingerlings fed at varying inclusion levels of *Cassia fistula* meal (CFM) showed that CFM could be substituted for soybean meal (SBM) up to 40% inclusion level in practical diets without adverse effect on growth or feed utilization. Adebayo *et al.* (2004) however, observed in the diet of *Oreochromis niloticus* that CFM could be substituted for SBM up to 170 g/kg inclusion without compromising growth.

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