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GROWTH PERFORMANCE OF *CLARIAS GARIEPINUS* FINGERLING FED COOKED BREADFRUIT *(ARTOCARPUS ALTILIS)* SEED MEAL AS REPLACEMENT FOR MAIZE IN OUTDOOR POND.

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ABSTRACT

The growth performance and nutrient utilization of cooked breadfruit *(Artocarpus altilis)* seed meal based diet as a replacement for maize for *Clarias gariepinus* fingerlings were investigated for 8 weeks. Five (5) diets of breadfruit seed meal substituted for maize at different levels of inclusion (0%; 25%; 50%; 75% and 100%) were fed to the fingerlings at 5% body weight twice daily in hapa of 1mx1mx1m. The hapas were submerged in a pond and each hapa was stocked with 20 fingerlings of mean weight of 5.8 ± 0.00g. Each treatment was replicated twice. Evaluation of growth parameters and nutrient utilization of the experimental diets showed that there was no significant difference (P>0.05) in Mean Final Weight (MFW); Specific growth rate (SGR); Feed Conversion rate (FCR); Protein efficiency ratio (PER) and Apparent net protein utilization (ANPU) among the treatments. The results suggested a net advantage of replacing dietary maize with cooked breadfruit seed meal for *Clarias gariepinus* fingerlings at 50% and above levels of inclusion under the condition of the experiment.

KEYWORDS:- Growth Performance, Breadfruit seed meal, Maize meal, *Clarias gariepinus*, Outdoor Hapa

INTRODUCTION

Artificial feeding is one of the principal methods of increasing production of fish cultivation. Its importance varies according to the intensity of aquacultural practice. Similarly the importance of feed in aquaculture cannot be over – emphasised. It promotes faster growth, allows higher stocking density, shorter cultivation period among others.

In Nigeria, the major ingredients used for livestock feeds including fish feeds, are highly competitive between industries, animals and man (Tuleun *et al.*, 2005). This situation seems likely to get worse if unconventional sources of feed ingredients are not identified and evaluated. It is of interest that a host of animal and crop byproducts abound in the country that can be used as substantial replacement for the conventional ingredient in fish feed. The non-availability of maize in required quantity and at certain times high cost in Nigeria, has led to search for alternative energy source for fish feed. Studies have been carried out on root and tuber crops but there are some energy rich fruits like breadfruit that are yet to be evaluated (Agugu and Okeke, 2005).

Breadfruit is a tropical energy-rich fruit that are produced by the breadfruit tree. It can be cultivated at minimum rainfall of 203cm, minimum temperature of 25.56°C and relative humidity of 70°C, conditions that are easily met in the mangrove, rainforest and derived savanna regions of Nigeria (Oladunjoye *et al.*, 2005). Besides, it is not known to be processable to any acceptable storage food form for man in Nigeria and a lot of wastage usually accompanies its production, including its seed. Breadfruit could be a potential energy food judging from its high metabolizable energy (M.E.) which range between 13.01 – 13.89 MJkg-1 (Ravindran and Zivakanesan, 1995; Oladunjoye *et al*, 2005). Apart from this information, there is paucity of information on the use of its seed in fish feed. Therefore this study was conducted to assess the effect of substituting breadfruit seed meal for maize in the diet of *Clarias gariepinus* fingerlings.

MATERIALS AND METHODS

The various feed ingredients were locally sourced. The Breadfruit seeds were cooked for 30 minutes to remove any anti-nutrition factors, sundried and milled. Similarly the soybean seeds were toasted. Five(5) Iso-nitrogenous diets of 40% crude protein was formulated substituting the cooked breadfruit seed (CBFS) for yellow maize at 0; 25; 50; 75; 100% with Diet 1 (0% CBFS as control).

Two hundred (200) *Clarias gariepinus* fingerlings of mean weight 5.80±00g were acclimatized for one week and divided into hapas of 20 fingerlings per hapa. The hapas were submerged in a pond using kuralyan rope with 2/3 inside pondwater. The dietary treatments were completely randomised to each treatment and replicated. The fish were fed at 5% body weight twice daily at 10.00hrs and 16.00hrs (Eyo, 1999). Batch weighing of 20 fingerlings per hapa was carried out weekly and the feed ration adjusted accordingly for 8 weeks. The breadfruit seed meal, experimental diets and the carcass (before and after) were analysed for proximate composition according to AOAC (1990).

The biological parameters measured were subjected to Analysis of Variance (ANOVA) (Steel and Torrie, 1980), while mean comparison were according to Duncan (1955). The biological parameters were computed as follows:

(i) **Mean Weight Gain (MWG).** This was computed as the difference between initial and final mean weight values of fish in each hapa.

(ii) **Specific Growth Rate (SGR).** This was computed according to Brown (1957)

$$SGR = \frac{L_n(\text{Mean Final Weight}) - L_n(\text{Mean Initial Weight}) \times 100}{\text{Time (days)}}$$

While L_n = natural logarithm.

(iii) **Food Conversion Ratio (FCR)** – was computed as

$$FCR = \frac{\text{Weight of Food Fed}}{\text{Weight gain of fish.}}$$

(iv) **Protein Efficiency Ratio (PER)** – computed according to Osborne *et al.*, (1919) as

$$PER = \frac{\text{Weight gain of fish}}{\text{Protein Fed.}}$$

(v) Apparent Net Protein Utilization (ANPU) – computed as

$$ANPU = \frac{100 \times \text{carcass protein gain}}{\text{Protein Fed.}}$$

Where carcass protein gain = final carcass protein minus initial carcass protein

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RESULTS

Table 1 shows the proximate composition of cooked breadfruit seed *(Artocarpus altilis)* meal. The crude protein level was about 13.13%, which was an indication that the seed is an energy source rather than protein concentrate. Similarly the nitrogen free extract was about 54%.

Table 2 depicts the levels of inclusion of various ingredients used in the study and the proximate composition. All the diets were isonitrogenous at 40% crude protein. It shows that all the diets met the target specification of the fish used in the experiment. The protein requirements of *Clarias gariepinus* had been reported by NRC (1983) to be between 35 – 40% crude protein. Table 3 shows the growth performance and nutrient utilization by fish fed the experimental diets. The responses showed that there was no significant difference (P > 0.05) in the mean weight gain (MWG); specific growth rate (SGR); food conversion ration (FCR); protein efficiency ratio (PER), and apparent net protein utilization (ANPU). However, fish fed diet 5 (DT5) has the best MWG of 11.40g highest SGR of 1.94% day^{-1}, highest PER (1.04) and ANPU (2.85). Conversely fish fed DT5 had the lowest FCR of 2.45.While the fish fed diet (DT1) had the lowest growth performance and nutrient utilization

Table 4 shows the proximate composition of the fish carcass fed the experimental diets. The result showed that there was no significant difference (P>0.05) in body composition.

Table 1: Proximate Composition of Cooked Bread fruit Seed *(Artocarpus altilis)* meal

Chemical Parameters	% Chemical Composition
Moisture	11.50
Ash	3.00
Crude Protein	13.13
Nitrogen Free extract	54.07
Ether Extract	12.50
Crude Fibre	5.80
	100

Table 2: Percentage Inclusion level and proximate composition of the Experimental Diets

Ingredients	DT1	DT2	DT3	DT4	DT5
	Experimental Diets				
	Level of inclusion of cooked Bread fruit seed mean (%)				
	(0)	(25)	(50)	(75)	(100)
Toasted full fat soybean meal	26.64	31.88	31.23	30.64	29.99
Fish mean	32.49	27.40	28.05	28.64	29.99
Cooked Bread fruit seed meal	0	8.93	17.86	26.79	35.02
Yellow Maize Meal	35.78	26.79	17.86	8.93	0
Vitamin-Mineral premix	5.00	5.00	5.00	5.00	5.00
	100.00	100.00	100.00	100.00	100.00
Proximate Composition (%)					
Moisture	10.40	10.80	10.60	7.80	9.00
Ash	10.20	8.80	8.80	9.00	8.40
Crude Protein	40.75	40.75	40.55	39.38	39.50
Ether Extract	11.20	14.60	13.40	13.60	15.60
Crude Fibre	17.85	17.10	16.15	15.45	14.30
Nitrogen Free extract	9.60	7.95	10.50	13.77	13.10
	100.00	100.00	100.00	100.00	100.00

Table 3: Growth performance and Nutrient utilization of *Clarias gariepirus* Fed the Experimental Diets

Parameters	DT1	DT2	DT3	DT4	DT5	±SEM
Mean Initial Weight (g)	5.80^a	5.80^a	5.80^a	5.80^a	5.80^a	0.00
Mean final Weight (g)	16.50^a	16.55^a	16.80^a	16.85^a	17.20^a	0.03
Mean Weight Gain g	10.70^a	10.75^a	11.00^a	11.05^a	11.40^a	0.02
Specific Growth Rate (% day^{-1})	1.87^a	1.88^a	1.90^a	1.91^a	1.94^a	0.02
Food Conversion Ration (FCR)	2.52^a	2.51^a	2.49^a	2.48^a	2.45^a	0.02
Apparent Net Protein Utilization	2.21^a	2.45^a	2.60^a	2.55^a	2.85^a	0.03

Data in the same row carrying same letters differed insignificantly (P > 0.05) from each other

Table 4: Proximate Composition of Carcass of Fish Fed Experiment Diets

Parameters	Initial Fish Body Composition	DT1	DT2	DT3	DT4	DT5	
Moisture	79.50	78.90	78.90	78.54	78.79	78.82	ns
Ash	2.00	1.80	1.40	1.50	1.90	1.60	ns
Ether Extract	2.05	2.40	2.20	2.40	2.30	2.10	ns
Crude Protein	13.50	14.38	14.50	14.50	14.60	14.66	ns
Nitrogen Free Extract	0.45	0.32	0.80	0.86	0.41	0.62	ns
	100.00	100.00	100.00	100.00	100.00	100.00	100.00

n.s = not significant

DISCUSSION

The results obtained revealed that the fish fed the five different experimental diets responded well in terms of growth. The different levels of inclusion of cooked breadfruit seed *(Artocarpus altilis)* meal did not have any deleterious effect in terms of growth when compared with maize. Similarly the result showed that there was no significant difference (P> 0.05) in MWG, SGR FCR, PER and ANPU among the dietary treatment. However, DT3, DT4, DT5 containing 50; 75; 100% cooked breadfruit seed meal replacement level with maize had relatively superior growth performance over DT1 with 100% maize. This finding further collaborates the earlier observation by Oladunjoye *et al* (2005) in their study where breadfruit seed meal was used to replace maize in the diet of broiler starter. However, the finding of this study is contrary to that reported by Nwokoro and Obusuyi (2006) when they replaced soybean meal with breadfruit seed meal in broiler starter diets. This is a

pointer that breadfruit seed meal can only best serve as energy source rather than protein. This is evidently shown in Table 1.

Despite good growth performance of all the fish fed the experimental diets as shown in Table 3 the low values of SGR, FCR, PER and ANPU may be attributable to high levels of crude fibre in the diets. Oladunjoye *et al* (2005) reported that high fibre content could be responsible for growth depression for broiler when breadfruit seed meal was replaced with maize. Haris (1980) reported that the average basal crude fibre energy feed of about 6% is for optimum growth of teleost fishes. Similarly, Lovell and Leary (1975) reported that increasing fibre content beyond the basal level could cause reduced growth of fishes owing to poor digestion of cellulose. At high inclusion levels of fibrous feedstuff, excessive dietary fibre causes dilution of nutrients especially protein which is primarily used for fish growth.

The major problem of feed production in aquaculture is the competition of most feed stuff by man, food manufacturing industries and livestock farmers (Tuleun *et al.*, 2005). It is believed that the use of unconventional feed stuff such as breadfruit seed meal, will gradually reduce this competition and the cost of feed.

The result of this study had suggested that breadfruit seed meal can replace maize in the diet of *Clarias gariepinus*.

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