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Growth of African Catfish *Clarias gariepinus* Fingerlings, Fed Different Levels of Cassava

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Abstract: Cassava *(Manihot esculenta)* was evaluated as a substitute for maize in the diet of *Clarias gariepinus* fingerlings over a 49 day period. Fingerlings (mean weight = 2.74±0.63 g) were subjected to five diet treatments in which maize was replaced with cassava at 0% (control); 25, 50, 75 and 100% level; at a stocking density of 7 fish per plastic bowl. Each treatment condition was replicated twice. Growth rate, specific growth rate and feed conversion efficiency were not significantly different ($p>0.05$) among the diet treatments. It is concluded that cassava flour can be included in the diet of *Clarias gariepinus*.

Key words: Cassava · African catfish · growth

INTRODUCTION

The major source of metabolisable energy in most compounded diets for fish and livestock is maize [1, 2].

However, the increasing prohibitive cost of this commodity as a result of its many competing uses, especially in developing African countries has made it necessary to evaluate other ingredients to replace maize with other cheaper carbohydrates. Cassava is widely grown in the tropics and is utilized by man and animals. It is a staple food for many Africans and various fast growing cultivars have been developed.

Its starchy, thickened, tuberous roots are a valuable source of cheap calories and its use in animal feed is increasing [3], because of its high energy content and its low price. In recent times, the use of cassava as a substitute for cereals in livestock and fish feeds has come under investigation. It has been shown [3], that substituting up to 40% of the maize in pig feed with cassava does not lead to any reduction in growth performance of pigs. Also, the use of cassava in the diet of white Fulani herds in Nigeria has been reported [3] to increase milk production by 22%.

Cassava as a replacement for maize in the diets of mirror carp *(Cyprinus carpio)* and rainbow trout *(Salmo trutta)* have also been investigated [4, 5].

The present study is aimed at using cassava as a replacement for maize in the diet of *Clarias gariepinus* fingerlings.

MATERIALS AND METHODS

Clarias gariepinus fingerlings (2.74±0.63 g initial weight) were subjected to five diet treatments; in which maize was replaced with cassava at 0% (control), 25, 50, 75 and 100% levels (Table 1).

Table 1: Ingredient and nutrient composition (g/100 g dry matter) of diets

	(% maize substitution)				
	0	25	50	75	100
Ingredient					
Maize	9.90	7.43	4.95	2.47	0.00
Cassava flour	0.00	2.47	4.95	7.43	9.90
Brewer's waste	9.90	9.90	9.90	9.90	9.90
Palm kernel cake	38.60	38.60	38.60	38.60	38.60
Fish meal	38.60	38.60	38.60	38.60	38.60
Bone meal	1.00	1.00	1.00	1.00	1.00
Vitamin premix	1.00	1.00	1.00	1.00	1.00
Oyster shell	0.50	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50	0.50
Nutrient content (%)					
Crude protein	40.95	41.75	42.97	43.32	44.54
Crude lipid	6.41	5.96	5.61	5.92	5.22
Crude carbohydrate	24.60	25.40	26.71	26.34	27.21
Crude fiber	9.07	8.07	7.14	8.05	6.10
Ash	12.05	13.98	11.09	11.07	12.01
Metabolisable energy (kcal/g)	2.88	2.92	2.98	3.01	3.03

The fish were acclimated to experimental and treatment conditions for four weeks before the start of the experiment. At the onset of the feeding trials, the fish were starved for one day to empty their gastro-intestinal tracts.

Fingerlings were distributed randomly into plastic bowls at a stocking density of 7 fish per bowl.

Each treatment condition was replicated twice.

Fish were fed at 3% body weight in two equal portions in the mornings and in the evenings.

Experimental fish were batch weighed at weekly intervals and the rations adjusted accordingly.

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Mortality was monitored daily and recorded. Water temperature, dissolved oxygen and pH were measured weekly.

The experiment lasted 49 days.

Diet performance was determined as follows:

$$\text{Feed conversion efficiencey} = \frac{\text{Wt. gained}}{\text{Feed consumed}} \times 100 = \%$$

$$\text{Specific growth rate} = \frac{\log w_2 - \log w_1}{t} = \text{g day}^{-1}$$

Where; w_2 = Final weight, w_1 = Initial weight, t = No. of days of experiment.

$$\text{Growth rate} = \frac{w_2 - w_1}{w_1 \times t} \times 100 = \%\ \text{day}^{-1}$$

Statistical analysis: The data were analysed using the one way analysis of variance [6].

RESULTS AND DISCUSSION

Survival of fingerlings was high in all treatments (Table 2).

Temperature ranged between 25.4°C and 27.9°C, with a mean of 26.6±0.8°C; dissolved oxygen ranged between 5.0 and 6.5 mg/L with a mean of 5.9±0.5 mg/L, while pH ranged between 7.1 and 8.7 (mean 7.6 ± 5.0). These physico-chemical parameters were within the limits acceptable for *Clarias* culture [7].

An analysis of variance revealed that growth rate ($F_{4,5}$ = 3.78; $p>0.05$); specific growth rate ($F_{4,5}$ = 1.25; $p>0.05$) and feed conversion efficiency ($F_{4,5}$ = 2.105; $p>0.05$) were not significantly affected by different levels of cassava inclusion in diet (Table 2).

The highest values of growth rate, specific growth rate and feed conversion efficiency were however obtained for the control diet in which there was no substitution of maize with cassava.

Similar patterns of growth have been reported in the mirror carp and trout fed different levels of cassava. Ufodike and Matty [4] reported the ability of mirror carp fingerlings to accept high quantities of cassava in diet. Mirror carp fed on a diet containing 45% cassava was found to perform better than those fed on lower quantities of cassava. Ufodike and Matty [5] also observed optimum growth and food utilization in rainbow trout fed 20% dietary cassava and there was no evidence of drastic adverse effects on the tissue and liver composition of fish.

Other investigators have observed favourable growth in *Oreochromis niloticus* [8] and *Clarias isheriensis* [9], fed cassava peels.

Table 2: Growth performance of *C. gariepinus* fed different levels of cassava

	Diet (% maize substitution)				
	0	25	50	75	100
Mean growth rate (% day^{-1})	2.370	1.750	2.150	1.570	1.600 ns
Mean specific growth rate (% day^{-1})	0.007	0.005	0.006	0.006	0.005 ns
Feed conversion efficiency (%)	50.750	35.950	42.860	35.880	34.070 ns
Survival (%)	71.430	92.800	92.800	85.720	100.000

ns-not significant at p>0.05

However, Tewe [10] noted that the presence of hydrocyanic acid, low protein and poor palatability of cassava roots and peels are the major drawbacks in the efficient utilization of cassava and its by-products in animal feeding. High hydrocyanic acid content tend to effect a bitter taste in the diet, thereby enhancing low palatability.

Satisfactory results on the use of cassava as a substitute for cereal have also been reported in pigs [11], chicken [10] and weaning rabbits [12].

It is concluded that cassava can be utilized in the diet of fish.

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