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GROWTH PERFORMANCE AND NUTRIENT UTILIZATION OF AFRICAN CATFISH (*CLARIAS GARIEPINUS*) FED VARYING DIETARY LEVELS OF PROCESSED CASSAVA LEAVES

***A .H. Bichi and M.K. Ahmad**
Department of Biological Sciences, Bayero University, PMB, 3011, Kano
*Correspondence author: ahbichi@yahoo.com

ABSTRACT
Four isocarloric and isonitrogenous diets were formulated to contain 0%, 33.3%, 66.7% and 100% cassava leaves to replace equal weight of maize meal. All the four treatment diets were fed to catfish (Clarias gariepinus) fingerlings in replicate for 16 weeks. The best growth response was obtained in fish fed 66.7% cassava leaves inclusion. Fish fed 100% cassava leaves had the lowest growth response. All the treatment diets showed that growth due to increasing dietary cassava leaves were significant (P<0.05). The results revealed that optimum requirement of cassava leaves level in the formulation of practical diets for the improve growth of Clarias gariepinus was 66.7% cassava leaves.

Key words: Clarias gariepinus, isocarloric, isonitrogenous, cassava leaves, diet

INTRODUCTION

Feed is one of the major inputs in aquaculture production and fish feed Technology is one of the least development sectors of aquaculture particularly in Africa and other developing countries of the World (Gabriel *et al*, 2007). High cost of fish feed was observed as one of the problems hampering aquacultural development in Nigeria (Gabriel *et al*, 2007)

Expensive feeds will marginalized or even nullify the profitability of fish farming thereby in-capacitating the expansion of farms to increase production and consequently low yield in terms of quality and quantity, resulting in the scarcity of the commodity (fish) and eventually high cost of the few available ones to the disadvantage of the populace Adikwu, (1992). Fish feed account for at least 60% of the total cost of production Gabriel *et al*, (2007). This has motivated the research for local, cheap and unsuitable for direct human consumption as alternative energy feed for *clarias gariepinus* that aim to reduce the cost of production without compromising fish quality. In view of the above the present research was set up with the objectives of determining the optimum replacement level of cassava leaf meal in formulated diets of *clarias gariepinus* and examine the growth performance and nutrient utilization of *claria gariepinus* fed varying replacement levels of cassava leaf meal.

MATERIALS AND METHODS

Experimental site

The research was conducted in laboratory (Aquarium) of the department of Biological sciences, Bayero University Kano, Nigeria, in eight (8) rectangular plastic tanks for a period of 16 weeks (112 days) between February and May 2009. Each tanks has a water holding capacity of 50 liters (49x33.5x33.5cm) (plate I) but water was maintained at the 20 liters levels throughout the study Eyo, (1994).

Cassava leaves processing

Sweet white cassava leaves (Manihot esculata) were collected from Kano State Agricultural and Rural Development Authority (KNARDA), Kano, Nigeria. The leaves were soaked for 3 days and sun-dried for 7 days to reduce the presence of cyanogenic glycosides. The dried leaves were grounded into fine powder and analysed for proximate composition according to the procedure in APHA (2006) and A.O.A.C (1999). (Table 2)

Fish diet formulation and processing

Four isocarloric and isonitrogenous diets were prepared to contains 0% (control), 33.3%, 66.7%, and 100% cassava leaves to replaced equal weight of maize.

Prior to forming (processing), the feed ingredients and experimental feeds were ground individually to a fine powder by using hammer mill machine, then individually weighed and properly mixed together with adequate water added to ensure smooth pelleting. The strands were cut into short pieces and sun-dried for 3 days to remove moisture Eyo, (1994). The pelleted diets were then packed in water impermeable bags (Nylon bags) and kept in freezer until use Gabriel, *et al*, (2007) and Amisah *et al*, (2009) (Table 1)

Experimental procedure

Fourty eight (48) mixed sex African cat fish fingelings (*Clarias gariepinus*) of average weight 12.57g, average standard length 10.8cm, and average total length were obtained from Bagauda fish seeds multiplication center, Kano state, Nigeria. The fish were acclimatized for 3 days (Okoye and Sule, 2001) and were fed with control diet at 5% of their body weight twice daily (8.00-9.00am) and (5.00-6.00pm). Madu *et al* (2001). The fish were starved for 24 hrs in order to empty their stomach and prepared their appetite for the new feed.

The fish initial weight ranging from 12.32-12.82g, mean weight 12.57g were weighed with mettler top loading balance. The initial mean total length (13.9cm) and initial means standard length (10.9cm) were measured with graduated ruler and recorded (Table 3).

The eight (8) plastic tanks were randomly allocated to four (4) treatment diets in replicates (Table 1) the fish were randomly distributed into the tanks at a stocking density of six (6) fish per tank and the tanks were covered with wire mesh to prevent fish from jumping out (Plate I). Fresh borehole water was used at the rate of one change per day.

The fish were fed at 5% of their body weight per day, twice daily, (morning 8.00-9.00AM) and (evening 5.00-6.00PM). Subsequently, weight, total and standard length measurements were taken after every two weeks (fortnightly) and the rations fed were adjusted according to the fish weight gain.

Water quality parameter were measured during each sampling fortnightly. Temperature was measured using mercury in glass thermometer, pH was measured by jenway pH meter (model 3150), dissolved oxygen was measured using dissolved oxygen meter (model 9146), the total Hardness (220-260) mg/l total ammonia (NH_3^-N) mg/l and nitrite were measured using digital spectrophotometer (model – DR-2010). The cyanide content of the cassava leaves was determined by spectrophotometer (Model DR-2010).

Condition Factor (K)

$$K = \frac{100W}{L^3}$$

where W = Final mean body weight (g); L = Mean standard length (cm)

was calculated, Adukwu (1992).

Analytical procedure

The carcass, feeds, experimental diets were analysed for proximate composition according to A.O. AC (1999).

Statistical analysis

Data obtained were subjected to analysis of variance (ANOVA) test and the means from the various treatments were compared for significant differences (P<0.05), using the computer statistical package for social scientists (spss-15) windows.

Table 1: Percentage Composition of Experimental Diets (as Fed) in Different Treatments.

Treatments Ingredients	I Control O % Cassava Leaves Inclusion	II 33.3% Cassava Leaves Inclusion	III 66.7% Cassava Leaves Inclusion	IV 100% Cassava Leaves Inclusion
White Maize	30	20	10	0
Cassava leaves	0	10	20	30
Fish Meal	18	18	18	18
Soya Beans	36	36	36	36
Wheat Middlings	10	10	10	10
Vitamin premix	1	1	1	1
Mineral premix	1	1	1	1
Vegetable oil	2	2	2	2
Bone meal	1	1	1	1
Salts	0.5	0.5	0.5	0.5
Chronic oxide	0.5	0.5	0.5	0.5
Total	**100**	**100**	**100**	**100**

Keys: % = (Percentage), g = (Gram)

Table 2: Proximate analysis of cassava leaves and its total cyanide content.

Composition parameters	% Crude
Crude Moisture	8.70
Crude Protein	7.66
Crude Fibre	2.63
Ether extract	12.60
Crude Ash	14.99
Cyanide Content (mg/l)	0.025

Keys: % = (Percentage) mg = (Milligram) L = (Litre)

Table 3: Growth response, Nutrient Utilization and Survival Parameters of Cat fish (*Clarias gariepinus*) fed different levels of cassava leaves for 16 weeks.

	I	II	III	IV
Parameters	**Control O %**	**33.3%**	**66.7%**	**100%**
Mean initial weight (g)	12.75	12.32	12.54	12.82
Mean final weight (g)	328. 80	330.62	685.52	275.20
Mean weight gain (g)	316.05	318.3	672.98	262.38
(MDWG) Mean Daily Weight gain (g/day)	2. 82	2. 84	6.01	2.34
Mean growth rate (MGR)	0.14	0.14	0.14	0.13
Specific growth rate (%/day) (SGR)	2.90	2.94	3.57	2.74
Feed conversion ratio (FCR)	0.15	0.15	0.12	0.16
Feed conversion efficiency (FCE)	682.1	671.2	846.0	622.1
Protein efficiency ratio (PER)	17.95	17.66	22.26	16.37
Condition factor (K)	1.16	1.76	1.71	4.08
Initial Number of fish	12	12	12	12
Final Number of fish	12	12	12	11
Survival (%)	100	100	100	92

Keys: % = (Percentage), g = (Gram)

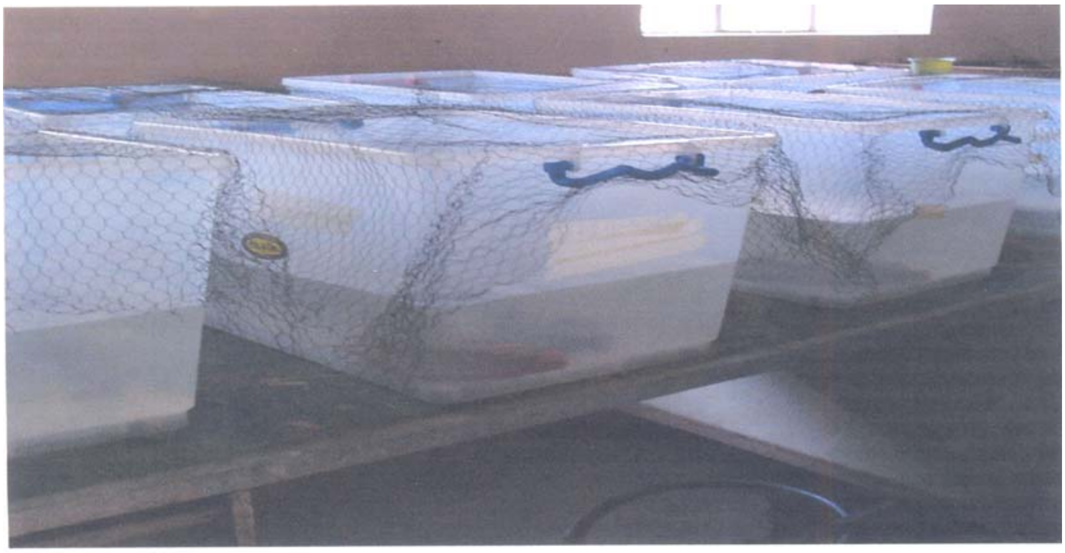

Plate I: Experimental set up

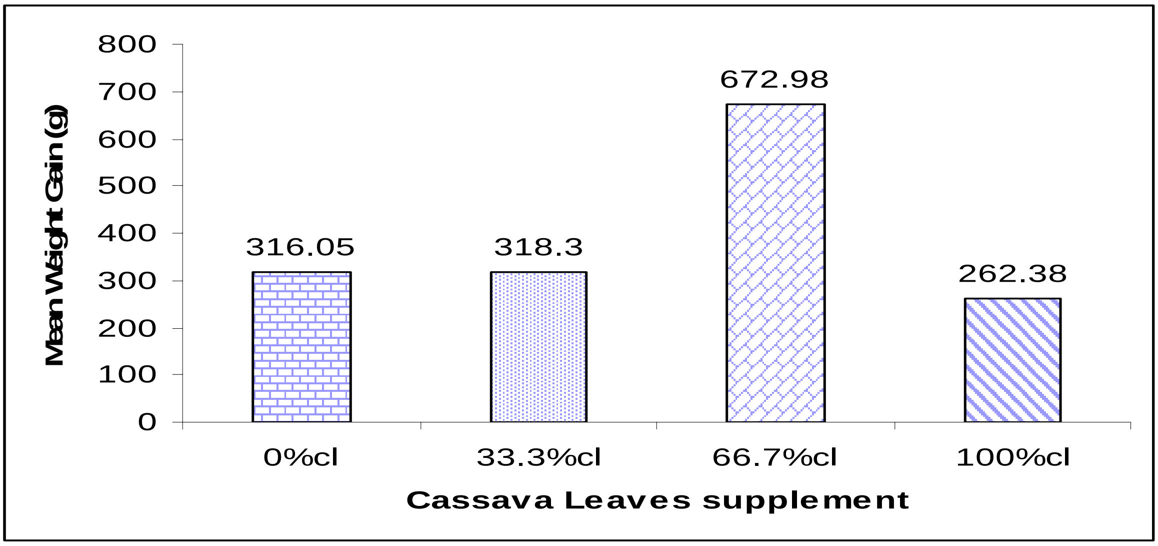

Figure 1: Effect of Cassava Leaves Supplement on Means Weight Gain in *Clarias gariepinus*
Key: cl= Cassava Leaves

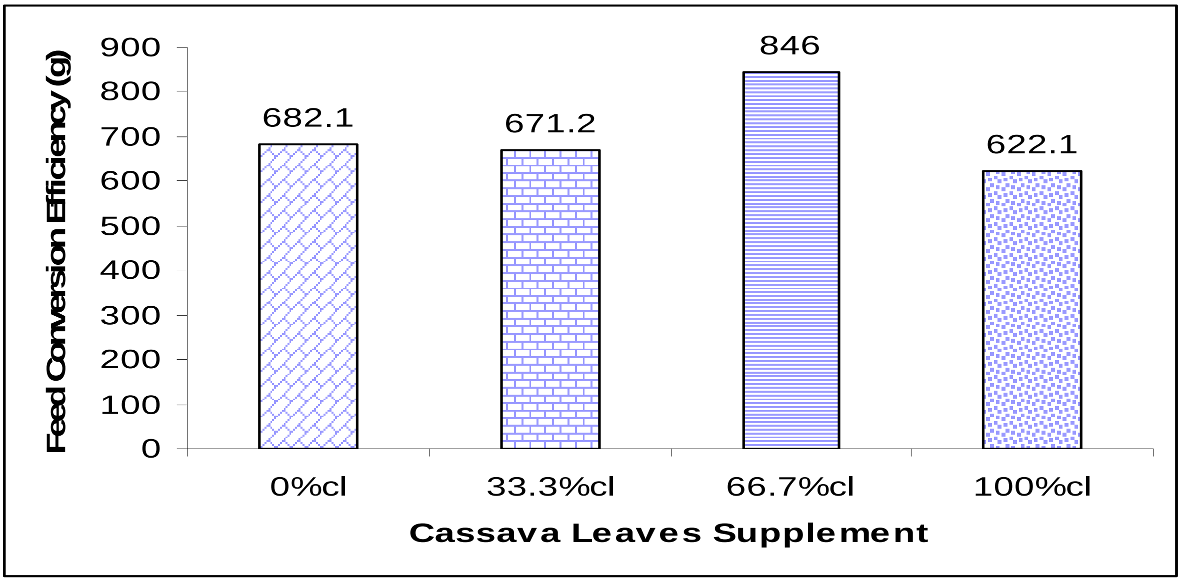

Figure 2: Effect of Cassava Leaves Supplement on Feed Conversion Efficiency in *Clarias gariepinus*
Key: cl= Cassava Leaves

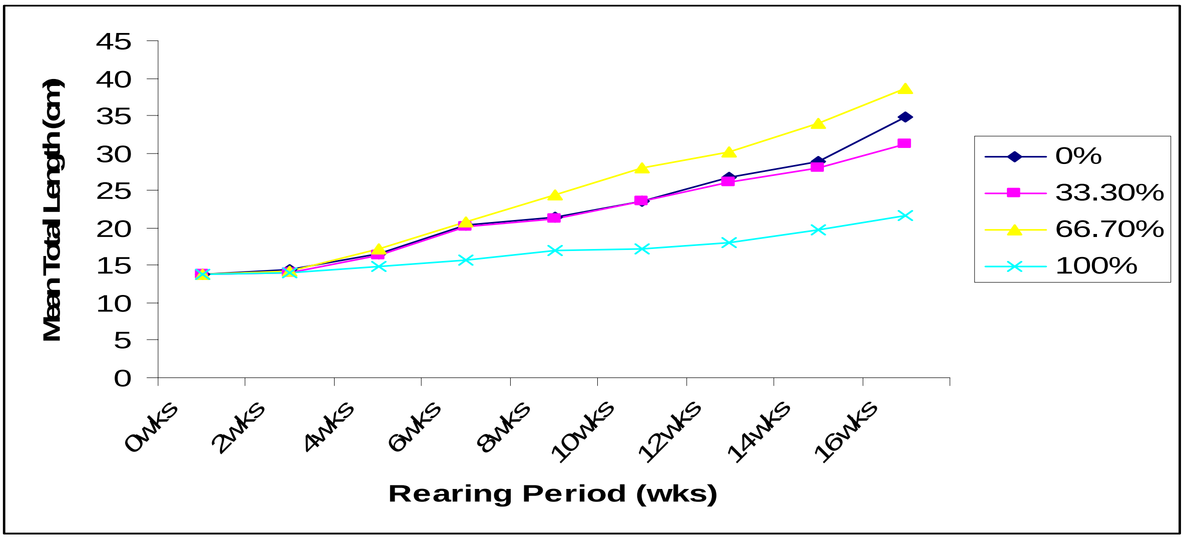

Figure 3: Effect of Cassava Leaves Supplement on Length Increment in *Clarias gariepinus* during the experimental period

RESULTS AND DISCUSSIONS

Table (3) shows the growth response, nutrient utilization, condition factor (K) and survival of the *Clarias quriepinus* fed varying dietary levels of processed cassava leaves for 16 weeks.

The fish showed good appetite to all the treatment diets, attested to by the increases in body weight (fig 1), increases in total length (fig 4) and increases in standard length. However the greatest weight gain (672.98g) was achieved with the treatment III containing 66.7% inclusion and the least weight gain (262.38g) was recorded with the treatment IV containing 100% cassava leaves inclusion (Fig 1). The greatest mean daily weight gain (MDWG) (6.01g) was achieved by the treatment III, containing 66.7% inclusion and the least mean daily weight gain was recorded by the treatment IV (2.34g) containing 100% cassava leaves inclusion (Table 3).

This is similar to the values obtained for *Oreochromis niloticus* by Faturoti and Akibote (1986), Wee and Ng (1986). The greatest specific growth rate, feed conversion efficiency (fig 3) and protein efficiency ratio (Fig 2) were achieved in the treatment III containing 66.7% inclusion and the least specific growth rate, feed conversion efficiency and protein efficiency were recorded by the treatment IV containing 100% inclusion (Table 4) (Fig 2 and 3). This observation is similar to that reported by Oresegun and Alegbeleye (2001), for *Oreochromis niloticus* fed cassava peels. Fish in all the treatment diets indicated that growth due to increased cassava leaves meal were significant ($P<0.05$). The best growth response was achieve in the fish fed 66.7% cassava leaves replacement and the least was recorded by the fish fed 100% cassava leaves replacement. The lower growth response by fish fed 100% cassava leaves inclusion was probably caused by reduced palatability of the diet which causes reduced in feed intake.

A similar trend was reported by Adikwu (1992) and Haruna (1997). All the experimental diets were accepted by *Clarias gariepinus*. This might be attributed to the good processing techniques which involved soaking and drying that might have reduced the antinutrient of cassava leaves and increases its palatability. This observation corroborates with the works of Amisah *et al* (2009), Olaniyi *et al* (2009), Faturoti and Akibote (1986), and Oresegun and Alegbeleye (2001).

The proximate composition of cassava leaves meal in the present study revealed that the crude protein content was 7.66% (Table 2). This value was lower than the values reported by some earlier researchers such as Faturoti and Akibote (1986) and Oresegun and Alegbeleye (2001). The differences might be attributed to differences in environmental conditions such as soil types, harvesting time and processing methods. The condition factors (K) were not significantly different (P> 0.05) from all the treatments. Similar results were obtained by Thomas *et al* (2003). The percentage survival was excellent throughout the experimental period. This could be as a result of good handling and good water quality management and the suitability of cassava leaves as inclusion in *claria gariepinus* diet. The water quality parameters obtained were within the recommended range for culture of *claria gariepinus* (Table 5). This conformed with the report of Adikwu (1992), Falaye (1992) and Madu *et al* (2001).

Conclusion

This study suggests that 66.7% cassava leaves replacement is considered as the optimum requirement for catfish (*Clarias gariepinus*) growth performance.

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