# GROWTH RESPONSE OF AFRICAN CATFISH (*Clarias gariepinus*) FED AFRICAN STAR APPLE KERNEL DIETS

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## ABSTRACT
An investigation was conducted to determine the effect of African Star Apple Kernel (*Chrysophyllum africanum*) based diets on the growth of African catfish (*Clarias gariepinus*) for 8 weeks. One hundred and thirty five African catfish fingerlings ( mean weight= 2.8g) were allotted to three diets (CP=40%) in which African Star Apple Kernel meal substituted maize at 0%, 50% and 100% dietary levels respectively and fed at 5% biomass daily. Result on growth performance indicated significant (P<0.05) differences in weight gain, feed intake, feed conversion ratio and Specific growth rate of fish between the control group and those fed the trial diets.
**Keywords**: African Star Apple Meal, diets, *Clarias gariepinus*, response

## INTRODUCTION
Nutritionally, fish is about the cheapest and direct source of animal protein and micro nutrients for several millions of Africans (Bene and Heck, 2005). In Nigeria, fish is widely accepted by the populace, thereby making the demand for it to be on the increase. In recent time, a good amount of fish consumed by Nigerians is from aquaculture because the conventional fish catch from ocean and rivers are continually declining due to over fishing and environmental hazards (FAO, 2006). Jamiu and Ayinla (2003) reported that feed accounts for minimum of 60% of the total cost of fish production in Africa including Nigeria and a major factor that determines the viability and profitability of fish farming enterprise. The need to intensify the culture of the fish, so as to meet the ever increasing demand for fish has made it essential to develop suitable diets either in supplementary forms for earthen ponds or as complete feed in tanks and other artificial enclosures (Olukunle, 2006). For the purpose of nutritional and economic benefits, previous researchers have made attempts at increasing the use of nonconventional plants and animal materials to replace conventional feed ingredients like maize and fish meal in fish feed ration ( Agbabiaka, 2012; Agbabiaka *et al.*,2013b,c). According to Olurin *et al.* (2006), maize is the major source of metabolisable energy in most compounded diets for catfish species. This is because it is readily available and digestible. However, the increasing and prohibitive cost of this commodity has necessitated the need to search for an alternative source of energy. Unorthodox feedstuff such as African Star Apple kernel is very appropriate for this purpose. The Crude protein content of raw Star Apple Kernel meal was reported to be 10.13±0.12% (Agbabiaka *et al.*, 2013a). The seed is endowed with crude protein comparable to some orthodox energy feedstuffs such as maize and millet (CP = 9 – 10%) and tigernut (7 – 9.5%) according to Aduku (1993); Oladele *et al.* (2009) and Agbabiaka (2012) respectively. In Nigeria, *Chrysophyllum africanum* is associated with dry season (December-April) and has been enjoyed over the years by Nigerians as a fruit (Adewusi, 1997). African star apple kernel is always regarded and seen as waste that has no economic value except for those that use it for traditional game, but using it to replace maize in the formulation of feed for livestock and fish will make it useful and also help to minimize the cost of feeding livestock and fish thereby reducing the competition between man and feed formulating industries on one hand and curtailing disposal/environmental problems also (Agbabiaka *et al.*, 2013a).

## MATERIALS AND METHODS
### Experimental site and sample preparation
The experiment was conducted at the Fish farm complex, Imo State Polytechnic Umuagwo-Ohaji. The sample (African Star Apple) used in this experiment were picked in the Polytechnic environment. The pulp (edible portion) was removed. The seed were dehulled to expose the mesocarp which was sun-dried for six days. The dried sample was ground into powder to form African Star Apple Kernel Meal (ASAKM) in order to facilitate pelleting. Sample of the African star apple meal was analysed for proximate

composition as stipulated by AOAC (2000) and shown in Table 1.

**Feed formulation**

The test ingredient (ASAKM) was incorporated with other feedstuffs to formulate three diets at 40% crude protein in which African star apple meal replaced maize at 0%, 50% and 100% coded as $T_1$, $T_2$ and $T_3$ respectively, while the control diet (0%) contained no African star apple meal. The diets produced were pelleted using 2mm die pelleting machine. The pelleted feeds were sundried to crispy for five days to prevent the growth of moulds and thereafter packed in waterproof bags and labelled accordingly before storage at room temperature.

**Experimental fish and design**One hundred and thirty five African Catfish (*Clarias gariepinus*) fingerlings with average of 2.8g body weight were purchased from a reputable commercial hatchery in Port Harcourt, Rivers State, Nigeria. The fish were fed with commercial feed for the period of seven days while undergoing acclimatization. Subsequently, they were randomly assigned to the three treatment diets at 45 fish per treatment in hapa nets measuring 1×1×1m suspended in outdoor concrete tank. Each treatment was replicated trice with fifteen fish per replicate. Thereafter, the fish were starved for 24-hours prior to the commencement of the feeding trial. The experimental diets were fed to the fish at the rate of 5% body weight per day, shared twice between the hours of 8-9am and 5-6pm. The experiment lasted for the period of 8 weeks.

**Data collection and statistical analysis**

The experimental fish (fingerlings) in each hapa were batch weighed at the beginning of the experiment (initial weight) and weekly thereafter, using a digital weighing balance. Fish were returned into their respective hapas thereafter; while feed intakes were adjusted according to the new body weight. Care was taken to curtail stressing the fish by making sure that the sampling/weighing was carried out in the morning between the hours of 7-8am when the sun is not yet out. The fish were not usually fed on sampling days to avoid regurgitation. Data on the feed intake, weight gained and feed conversion ratio for the three groups were computed and subjected to Analysis of variance (ANOVA), where significant difference was detected, mean were separated using Duncan new multiple range test as outlined by Obi (1990).

## RESULT AND DISCUSSION

The result of the proximate analysis of Star Apple Kernel based diets is shown in Table 2, while Table 3 represents the growth performance of fish fed ASAKM based diets respectively. The proximate analysis of the diets (Table 2) revealed that the crude protein content was highest in control ($T_1$) and reduced as the concentration of Star Apple Kernel meal (ASAKM) increased in the diets. This may be attributed to the inferior crude protein content (8.13%) of the raw test ingredient (ASAKM) compared to maize (10% CP) (Aduku, 1993; Agbabiaka *et al.*, 2013a). The crude fibre is relatively lower in ASAKM based diets compared to the control. However, it was expected that the experimental fish will consume more of Star Apple Kernel meal but the reverse was the case (Esonu *et al.*, 2001; Agbabiaka, 2012). This may be attributed to the inherent anti-nutritional factors of African Star Apple Kernel such as tannins, oxalate and phytate that inhibit feed intake and subsequently the utiization of nutrients for growth (Agbabiaka *et al.*, 2013a). The above reason was perhaps responsible for the poor growth rate exhibited by the fish on ASAKM diets (Table 3). There was also a significant ($P<0.05$) difference between the fish in control diet $T_1$ compared with $T_2$ and $T_3$ in feed intake and this was attributed to the anti-nutrients such as tannins and phytate that inhibits feed intake. Similar observation was reported when raw mango seed kernel diets were fed to fingerlings of *Clarias gariepinus* (Agbabiaka *et al.*, 2010). Nevertheless, there was no mortality throughout the duration of the study. This shows that ASAKM was not lethal to the fish though it did not support growth appreciably, hence, may be recommended for ornamental fish feed fomulation instead of aquaculture fish species necessary to be fattened within a short period.

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Table 1. Proximate composition of African star apple kernel

| Nutrients | Concentration (%) |
|---|---|
| Moisture | 14.66 |
| Ash | 7.25 |
| Crude Protein | 8.13 |
| Crude Fat | 9.72 |
| Crude Fibre | 1.22 |
| Nitrogen Free Extracts | 71.45 |

Table 2: Composition of Experimental Diets Fed to African Catfish Fingerlings

| | Dietary inclusion of ASAKM | | |
|---|---|---|---|
| Ingredients | 0% | 50% | 100% |
| Star Apple Kernel | 0.00 | 5.00 | 10.00 |
| Maize | 10.00 | 5.00 | 0.00 |
| Soya bean | 53.00 | 53.00 | 53.00 |
| Fish meal | 26.00 | 26.00 | 26.00 |
| Spent grain | 6.00 | 6.00 | 6.00 |
| Bone meal | 2.00 | 2.00 | 2.00 |
| Oil | 2.00 | 2.00 | 2.00 |
| Salt | 0.25 | 0.25 | 0.25 |
| Methionine | 0.25 | 0.25 | 0.25 |
| Premix | 0.25 | 0.25 | 0.25 |
| Lysine | 0.25 | 0.25 | 0.25 |

| | | | |
|---|---|---|---|
| **TOTAL** | **100.00** | **100.00** | **100.00** |
| Crude Protein | 39.93 | 37.37 | 36.77 |
| Crude Fat | 9.24 | 12.85 | 10.32 |
| Crude Fibre | 8.23 | 6.77 | 6.11 |
| Nitrogen Free Extracts | 22.21 | 24.9 | 26.02 |

Table 3: Growth Performance Of African Catfish Fed African Star Apple Kernel Meal Diets

| PARAMETERS | 0% | 50% | 100% |
|---|---|---|---|
| Mean Initial Weight (g) | $2.80^a$ | $2.80^a$ | $2.80^a$ |
| Mean Final Weight (g) | $28.60^a$ | $17.30^b$ | $16.30^b$ |
| Mean Weight Gain (g) | $5.50^a$ | $14.50^b$ | $13.50^b$ |
| Specific Growth Rate (%/day) | $2.48^a$ | $2.05^b$ | $1.99^b$ |
| Feed Conversion Ratio | $1.10^a$ | $1.60^b$ | $1.70^b$ |
| Protein Efficiency Ratio | $2.27^a$ | $1.67^b$ | $1.60^b$ |
| Mean Growth Rate (g) | $0.45^a$ | $0.26^b$ | $0.24^b$ |
| Protein Intake | $11.24^a$ | $8.69^b$ | $8.45^b$ |
| Mean Feed Intake (g) | $28.15^a$ | $23.25^b$ | $22.98^b$ |

[ab]Means within rows with same superscript are not significantly different (P>0.05)