ASSESSMENT OF PERFORMANCE OF *CLARIAS GARIEPINUS* (AFRICAN CATFISH) JUVENILES ON DIETS SUPPLEMENTED WITH KOLA POD HUSK (*COLA NITIDA*)

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Abstract

A twelve -week feeding trial was carried out to assess the nutritive potentials of kola pod husk and to assess the growth performance of *Clarias gariepinus* juveniles on varying levels of kola pod husk- supplementation. The objective of this study was to assess the nutritive potentials of kola pod husk on the performance of *C. gariepinus* and its level of incorporation in such diets.

Eight experimental bowls ($60x30x30cm^3$) were used for the experiment. There were four treatments with each treatment having two replicates. The fish had initial mean body weight of 10.56g. The experimental diets were formulated at 38% crude protein and the fish fed at 5% of their body weight three times per day with graded levels of 0,10,20, and 30% of kola pod husk. 15 fish were stocked per replicate. Proximate composition of fish before and after the experiment, proximate composition of kola pod husk, the growth performance and nutrient utilization of feed by fish were determined.

Significant differences were observed between the control diet and 10 -20 % inclusion of kola nut pod husk with the control having the best growth indices. However fish on 30 % kola pod husk inclusion performed best among kola nut pod husk -containing diets .There was no significant difference between 30 % inclusion of kolanut pod husk and the control diet on all parameters considered.

The inclusion of 30% sun –dried and kola nut pod husk produced the best growth performance of the experimental fish and could be considered as a potential energy supplier in *C. gariepinus* juveniles' diets subject to further studies

INTRODUCTION

The deficiency of animal protein intake by increasing human population has highlighted the need for greater fish production to meet animal protein requirement (FAO,1997).Fish is a high quality food containing first class protein and nutrients, important for human health and growth. Fish farming offers an opportunity for mass production of fish in Nigeria. With the cultivation of just 20% of about 1.8 million hectares of land suitable for fish farming and at production rate of 3 tons /1 hectare, it was estimated that fish farming could produce 1,313,634 tons of fish annually (Tobor, 1989) but the present production falls short of this estimate.

Nigeria depends largely on the importation of many feed ingredients like fish meal (Ahman, 1991). The cost of fish feed in Nigeria constitutes a disincentive to small scale fish farming. The scarcity and increase in the cost of feed ingredients like maize, guinea-corn, groundnut cake, soybean cake, lead to increased cost of finished feeds and supplementary feeding of fish Alteor (1986) observed that numerous feed formulations and potential feed stuffs are allowed to rot away unused. It is curious to note that most of the tropical world, including Nigeria dispose of large tonnage of agro-industrial by- products and "Wastes" from abattoirs,

vegetables oil, milling, sugar industries, rice and flour milling, cassava and cocoa processing. Quite often, filling of ditches is the common means of their disposal. This situation should not be allowed to continue given the potential of some these by- products as partial or total replacement for the expensive and scarce conventional feed ingredients. Falaye (1998) stressed the need to consider the nutrient composition, relative cheapness and availability of the feedstuffs in question.

Kola is grown in Africa and cultivated to a large extent in Nigeria, Ghana, Ivory Coast. It is also grown in Brazil and the West Indian Islands (Oludemokun, 1983). Annual production from these countries alone is in excess of 250,000 tons while the world production is about 300,000 tons (American Horticultural Society, 2002). Nigeria produces 88% of the world's kola production and 90% of this is consumed locally while the remaining 10% is exported. This finding was supported by Oluokun and Oladokun (1999) who claimed that Nigeria produced two million metric tons of kolanut annually representing 70% of the world's kolanut production. Kolanut, has several uses including direct consumption, beverages, drinks and wines, flavouring materials, alkaloids caffeine and theobromine, laxatives, heart stimulants, dyes, sedatives. Several parts of the plant are also used in traditional medicine.

Kola pod husk is a by-product from processing the seed widely used for animal feeding because of its high nutritive quality and has been reported to produce outstanding growth performance in broiler chicken (Babatunde and Hamzat, 2005). The kola pod husk has also been utilized for the production of liquid soap.(Asogwa *et al* ,2006)

This study was undertaken to explore the possibility of incorporating kola pod husk (KPH) into the diet of *Clarias gariepinus* juveniles to determine how much could be incorporated with no adverse effects.

MATERIALS AND METHODS

The experiment was carried out in the Department of Wildlife And Fisheries Management's laboratory for twelve weeks. Fingerlings were purchased from a fish farm in Ibadan and acclimatized for 2 weeks before the experiment. Each 23-litre circular bowl contained eleven fingerlings and fallowed tap water (Boyd, 1979). The water in each bowl was changed every other day, to get rid of excess feed and faeces.

Preparation of Diet

Sun-dried KPH was obtained from Cocoa Research Institute of Nigeria, Ibadan and ground into fine powder. Other feed ingredients were fishmeal, groundnut cake, and soybean meal, premix, salt, bone meal, methionine and lysine.The experimental diets were formulated to contain 38% crude protein as recommended for *C. gariepinus* (Faturoti *et al,* 1986). Four experimental diets were produced containing 0, 10, 20 and 30% KPH. Hot water was added to the ground feed to gelatinize it for effective pellet formation. The pellets were sun dried for two days to reduce the moisture and prevent deterioration then packed in bags and stored ready for use.

Feeding and Management of *C. gariepinus* Fingerlings

The fingerlings were fed at 5% of their total body weight twice daily,weighed every other week and their feeding regime adjusted according to their weights. The water in the bowls was changed every two days using a plastic pipe to siphon the water and the dirt out. Water from each bowl was measured for dissolved oxygen and hydrogen ion concentration (pH).Proximate analyses of the feed and fish were carried during the experiment.

Nutrient Utilization and Performance of Fish

Protein intake was calculated based on the feed intake and percentage protein in the experiment diet.

Protein intake:

$$P.I = \frac{\text{Feed intake x Percentage protein in diet}}{100}$$

The specific growth rate (SGR) : $SGR = \frac{\text{Log e W2-Loge X100}}{T2-T1}$

Where

W2= Final weight of fish at timeT2 by days

W1=Initial weight of fish at time T 1 by days

T2-T1 =Experimental period in days

Log e = natural logarithm

Feed Conversion Ratio (FCR): $\frac{\text{Feed intake}}{\text{Net weight gain}}$

Efficiency of feed conversion: $\frac{1}{\text{Feed conversion ratio}}$

A scoring system with a hedonic scale ranging from 1-9 was used to test for organoleptic properties and acceptability of the fish to consumers. Parameters employed by the panel were: colour ,taste, flavour, mouth feel, tenderness ,and overall acceptability .The scoring pattern was as follows : 9 Like extremely,8 Like Very much,7 Like moderately ,6 Like slightly,5 Neither like nor dislike,4 Dislike slightly,3 Dislike moderately ,2 Dislike very dislike very much and 1 Dislike extremely.

RESULTS AND DISCUSSION

Composition of diets and performance of fish are shown on tables 1 to 4

The water quality parameters during the study were temperature 27 – 28^{0}C, dissolved oxygen 7.36 mg/l and pH 7.2-7.9. These water conditions fell in line with the recommendations of Boyd (1984).The proximate composition of sun-dried KPH was 10.22, 16.4, 1.0 percent and 3190Kcal/Kg for crude protein, crude fibre , ether extract and energy respectively.

Table 1: Gross Composition of Experimental Diets

Ingredients	Treatments			
	0	1(10%KPH)	2(20%KPH)	3(30%KPH)
Maize	36.40	32.76	29.12	25.48
Fish meal	15.51	15.51	15.51	15.51
Soybean meal	31.02	31.02	31.02	31.02
Groundnut cake	15.51	15.51	15.51	15.51
Additives	1.56	1.56	1.56	1.56
KPH(g)	0.0	3.64	7.28	10.92
Total	100	100	100	100

Table2. Proximate Composition of Experimental Diets (%)

Treatment	Crude protein	Crude fibre	Ash	Moisture content	Ether extract	Nitrogen free extract
0%KPH(control)	44.45	5.06	9.72	9.83	6.57	24.37
1(10%KPH)	43.93	6.28	10.56	8.66	7.14	23.43
2(20%KPH)	42.88	7.85	9.86	9.93	7.63	21.85
3(30%KPH)	44.63	6.94	10.92	8.48	6.94	22.09

Table 3: Growth and Nutrient Utilization of *Clarias gariepinus* on KPH-based Diets

	O%KPH	10%KPH	20%KPH	30%KPH
Experimental period (days)	84	84	84	84
No. of fish stocked	11	11	11	11
Mean initial weight (g)/fish	12.00	10.65	10.65	9.60
Final mean weight	32.39	22.36	19.57	29.62
Total weight gain/fish	20.39	11.71	9.57	20.02
Daily weight gain (g)	0.01	0.01	0.01	0.01
Total feed intake (g)	2.55	2.37	2.27	2.41
Specific growth rate	0.24	0.14	0.11	0.23
Total percentage weight	269.9	209.9	195.7	308.5
Protein intake	0.89	0.82	0.79	0.84
Feed conservation ratio	0.13	0.20	0.24	0.12
Gross efficiency food conservation	769.2	500.0	416.7	833.3

Table 4: Proximate Composition of Experimental Fish at the end of the Experiment

Treatment	Crude Protein	Crude Fibre	Ash	Moisture Content	Crude fat	N.F.E
0%KPH	40.60	1.03	14.89	25.20	8.74S	9.54
10%KPH	41.30	1.34	15.76	19.17	9.16	13.27
20%KPH	39.20	1.82	14.96	22.85	11.23	9.92
30%KPH	42.70	1.48	16.67	23.69	8.97	6.49

This study was carried out to determine the performance of *Clarias gariepinus* juveniles on diets supplemented with KPH. Four diets were tested containing 0, 3.64, 7.28 and 10.92 grams of KPH representing 0, 10, 20 and 30 percent KPH inclusions. From the proximate analysis of the diet, crude protein ranged from 42.88 to 44.63, crude fibre 5.06 to 7.85, ash 9.72 to 10.92, moisture content 8.48 to 9.93, crude fat 6.57 to 7.63 and nitrogen free extractive 21.85 to 24.37 percent. Diet 3 contained the highest crude protein and ash. And fish on treatment 3(30% KPH) had the highest crude protein and ash contents which may have been the reason for better growth than treatments containing 10 and 20% KPH.

The Fish on control diet performed best in most parameters. The treatments were significantly different ($p<0.05$) for weight gain and specific growth rate . Among the KPH-based diets, the best performance ($p< 0.05$) of fish was recorded on 30 % KPH inclusion. In all, better performance of fish on control diet could be due to the high fibre content of KPH which may have inhibited proper utilization of the nutrients by fish. This finding was in contrast with those of other workers who suggested that KPH could replace maize in poultry diets by up to 60 percent (Yahaya *et al*., 2001; Hamzat, 2001; Hamzat and Babatunde, 2001; Hamzat and Longe, 2002; Hamzat *et al*., 2000; 2002; Olubamiwa *et al*., 2002). This may be due to the fact that unlike terrestrial animals , fish depend more on protein sources for energy supply

The mean weight and length of fish in all treatments differed significantly ($p<0.05$) over time. The mineral composition of fish on experimental diets were as follows: 0% KPH :0.163,0.757 ,0.0052; 10%KPH 0.83,0.815,0.0061;20%KPH :0.152,0.699,0.0054, and 30% KPH :0.194 ,0.903 and 0.0068 percent for calcium, phosphorus and iron respectively. No mortalities were recorded during the study indicating that the experimental diets were adequate to sustain the fish and support growth. The proximate analysis of fish at the end of the experiment however showed the highest crude protein and ash contents in fish on 30% KPH replacement for maize. These values differed significantly ($p<0.05$) from the control.

The acceptability of the fish was tested by respondents. No significant differences were observed for all treatments. The inclusion of KPH up to 30% was acceptable to the respondents. It was therefore concluded that it is possible to incorporate KPH in diet of *Clarias gariepnus* and up to 30 % substitution of KPH for maize proved the best treatment after the control without significant ($p< 0.05$) decrease in weight, length and quality. However, there is a need for further research on further substitution of kola pod husk for maize in the diet of *Clarias gariepinus* fingerlings.

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