

## The Use of Palm Kernel Cake in Replacement of Maize on the Performance of Broiler Chickens Reared in Rainforest Zone, Nigeria

<sup>1</sup>KPEREGBEYI, J.I AND <sup>2</sup>ENERUVIE, B.E.

<sup>1</sup>Department of Agricultural Technology, Delta State Polytechnic, Ozoro, Delta State, Nigeria.

<sup>2</sup>Department of Agricultural Technology, Akanu Ibiam Federal Polytechnic, Unwana, Afikpo, Ebonyi State.

E-mail: [jameslovekperegbeyi@gmail.com](mailto:jameslovekperegbeyi@gmail.com) or [james\\_kperegbeyi@yahoo.com](mailto:james_kperegbeyi@yahoo.com)

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### ABSTRACT

This study investigated the performance and economics of broilers fed diets containing graded levels of palm kernel cake at Delta State Polytechnic, Ozoro, Poultry Research Farm, between January and February, 2013. Two hundred Hubbard strain of broiler chicks were randomly allotted to five diets in which palm kernel cake replaced maize at 0, 25, 50, 75, and 100 % levels designated as diets A, B, C, D and E respectively. Each treatment diet was replicated 4 times consisting of 10 birds per replicate in a completely randomized design (CRD). The data generated were subjected to analysis of variance techniques as described by Steel and Tome (1980). Feed and water were provided *ad libitum* and the feeding trial lasted for eight weeks. The diets were iso-nitrogenous but at varying caloric levels. The daily feed consumption of the birds significantly increased as the levels of palm kernel cake increased up to 75 % of maize replacement. Daily weight gain of 42.09 g, 42.61 g and 50.06 g for broiler chicks fed diets B, C and D respectively was significantly affected by dietary replacement of maize with palm kernel cake variety during the starter phase. The result showed that chicks on diets containing 25, 50 and 75 % palm kernel cake gained significantly more weight than those in control and 100 % palm kernel cake diets. Feed conversion ratio of 2.96, 2.99, 2.60, 2.53, and 2.31 at starter phase and 2.76, 2.62, 2.56, 2.48, and 2.34 at finisher phase for diets A, B, C, D and E showed no significant difference among the dietary treatment during both starter and finisher phases. The overall average daily feed intake and-weight gain (0 - 8 weeks) was not significantly affected by dietary treatments ( $P < 0.05$ ). Economic analysis showed that feed cost in Naira per kg decreased with increasing levels of palm kernel cake up to 75 %. The result of this study revealed that palm kernel cake variety could completely replace maize in broiler diets without depression in performance, however, 75 % level of replacement is more economical and therefore recommended.

**Keywords:** Hubbard Strain, Palm Kernel Cake, Feed Cost, Replacement, Feed Conversion Ratio, Feed Intake.

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### Introduction

In Niger Delta region, acute shortage and feed ingredients are responsible for the present rise in prices of poultry and livestock feeds. This in turn results to high

cost of livestock and poultry products leading to deficiencies of animal protein in the diets of average Nigerians (Adamu *et al.*, 2006 and Adeyemi *et al.*, 2006). There is, therefore, the need to seek alternative, non-conventional sources of feedstuffs such as agro-industrial by-products and wastes which are not directly utilizable by man but are locally available, relatively cheaper and capable of replacing part or all of the maize in poultry feeds. Palm kernel cake, a product of oil processing, may be one of such by-products.

Palm kernel cake supplies both protein and energy; its crude protein content of 18% classified it as a protein source of medium grade (Chin, 2001). It however has high fibre content (12%) and it is reported to have a low metabolisable energy value for poultry. With due consideration to the large quantities of palm kernel cake produced annually in Niger Delta region and to the relatively low competition compared with maize, this study was designed to evaluate the economics and performance of broiler chicken fed diets containing graded levels of palm kernel cake as a substitute for maize.

### **Materials and Methods**

The experiment was conducted at the Delta State Polytechnic, Ozoro, and Poultry Research Farm. It is located within the Polytechnic which is on latitude  $5^{\circ} 30'$  and  $5^{\circ} 45'$  N of the equator and longitude  $5^{\circ} 40'$  and  $6^{\circ}$  E of the Greenwich Meridian, The area has an annual rainfall of between 2500 - 3000 mm and mean temperature at the farm was  $27.4^{\circ}\text{C}$  with range from  $25^{\circ}\text{C}$  to  $30^{\circ}\text{C}$  all through the period of the study,

Two hundred Hubbard strain of day-old were used for this experiment. The chicks were brooded in brooder house and managed on deep litter; an open sided poultry house in pens separated by wooden partitions; each measuring  $1.75\text{ m}^2$ . During the brooding period, each pen was provided with a 200 watt electric bulb to provide an optimum temperature. The birds were vaccinated according to schedule; Coccidiostat was given at intervals of 2 to 3 weeks for prevention against coccidiosis. Antibiotics were administered, at regular intervals to prevent bacterial infection.

At the commencement of the experiment, the birds were weighed and randomly allocated to 5 similar groups (on equal weight basis) of 40 birds each. Each treatment diet was replicated four times consisting of 10 birds per replicate in a Completely Randomized Design (CRD).

The chicks were randomly allotted to five diets in which palm kernel cake replaced

maize at 0, 25, 50, 75 and 100 % levels designated as diets A, B, C, D and E respectively (Table 1 and 2), Feed and water were supplied *ad libitum* and the experiment lasted for eight weeks. The birds were weighed; daily feed intake, body weight gain, feed conversion ratio and mortality were recorded.

The data generated were subjected to analysis of variance (ANOVA) techniques as described by Steel and Torrie (1980).

### Results and Discussion

The chemical analyses of the experimental diets were given in Table 1 and 2. The value obtained showed that all the diets met the minimum requirements for broiler growth and development (Olomu, 1995). The result for the performances of broilers fed experimental diets during the starter and finisher phases are presented in Table 3 while the gross performance of broilers fed experimental diets (0-8 weeks) is presented in Table 4. The results obtained (Table 3) showed that daily feed consumption of broiler chicks of 73.89 kg, 81.62 kg and 75.81 kg for diets B, C, and D respectively were significantly ( $P<0.05$ ) influenced by dietary levels of palm kernel cake during the starter phase (0 - 4 weeks).

The daily feed consumption of the birds significantly increased as the levels of palm kernel cake increased up to 75 % of maize replacement. Daily weight gain of 25.40 g, 29.20 g and 29.65 g for broiler chicks fed diets B, C and D respectively was significantly affected by dietary replacement of maize with palm kernel cake during the starter phase. The result showed that chicks on diets containing 25, 50 and 75 % palm kernel cake gained significantly more weight than those on control and 100 % palm kernel cake diets (Table 3).

Feed conversion ratio of 2.96, 2.99, 2.60, 2.53, 2.31 at starter phase and 2.76, 2.62, 2.56, 2.48, 2.34 at finisher phase for diets A, B, C, D and E showed no significant difference among the dietary treatment during both starter and finisher phases (Table 3).

The results showed that daily feed consumption and daily weight gain were significantly ( $P<0.05$ ) affected by the dietary treatments. The results suggested that chicks fed diets containing combinations of the different gains have better weight gain than those fed with diets containing each of the grain alone, which was in disagreement with the findings of Onwudike (1986).

The overall average daily feed intake and weight gain (0 - 8 weeks) was not significantly affected by dietary treatments ( $P<0.05$ ) (Table 4). Daily feed

intake, daily weight, feed conversion ratio and mortality were not significantly affected by the dietary treatments for both finisher and combined phases (Table 3 and 4). These findings are in agreement with the findings of Kperegbeji and Akpobasa (2008). However, it contradicts the work of Adamu *et al.*, (2001).

Economic analysis showed that feed cost in Naira per kg decreased with increasing levels of palm kernel cake up to 75 % (Table 5). The result showed that as the replacement value of palm kernel cake increases, total weight gain increases while the cost of feed per kilogram gain decreases up to 75 % replacement. Beyond 75 % replacement, the results showed increased feed consumption without increase weight gain. This accounts for more feed cost per weight gain in diet containing 100 % maize than the one containing 75 % palm kernel cake. This can be justified with the fact that palm kernel cake cost less than maize.

### **Conclusion**

The result of this study revealed that palm kernel cake could completely replace maize in broiler diets without depression of performance, however 75 % level of replacement is more economical and therefore recommended.

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**Table 1: Ingredient and Chemical Composition (%) of Palm Kernel Cake Based Diets Fed to Broilers at the Starter Phase (0 - 4 Weeks).**

Ingredients	DIETS				
	A (0 %)	B (25 %)	C (50 %)	D (75 %)	E (100 %)
Maize	42.00	31.50	21.00	10.50	0.00
Palm Kernel Cake	0.00	10.50	21.00	31.50	42.00
Soya bean (full fat)	30.00	30.00	30.00	30.00	30.00
Wheat Bran	19.55	19.55	19.55	19.55	19.55
Fish Meal	5.00	5.00	5.00	5.00	5.00
Bone Meal	2.50	2.50	2.50	2.50	2.50
Methianine	0.10	0.10	0.10	0.10	0.10
Salt	0.35	0.35	0.35	0.35	0.35
Premix	0.50	0.50	0.50	0.50	0.50
<b>Total</b>	<b>300</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>Calculated Analysis</b>					
Crude-Protein (%)	24.63	25.26	25.30	25.57	25.88
ME(kCal/kg)	3001.20	2998.71	2984.45	2965.25	2950.15
Calcium (%)	1.22	1.23	1.24	1.23	1.23
Total Phosphorus (%)	0.96	0.96	0.95	0.95	0.95
Ether Extract (%)	8.96	8.82	8.76	8.65	8.55
Crude Fibre (%)	3.50	3.50	3.50	3.50	3.50

**Table 2: Ingredient and Chemical Composition (%) of Palm Kernel Cake Based Diets Fed to Broilers at the Finisher Phase (5 - 8 Weeks)**

Ingredients	DIETS				
	A (0%)	B (25%)	C (50%)	D (75%)	E (100%)
Maize	46.40	34.80	23.20	60	0.00
Palm Kernel Cake	0.00	11.60	23.20	34.80	46.40
Soyabean (full fat)	30.75	30.75	30.75	30.75	30.75
Wheat Bran	19.40	19.40	19.40	19.40	19.40
Bone Meal	2.50	2.50	2.50	2.50	2.50
Methianine	0.10	0.10	0.10	0.10	0.10
Salt	0.35	0.35	0.35	0.35	0.35
Premix	0.30	0.50	0.50	0.50	0.50
Total	100	100	100	100	100
<b>Calculated analysis</b>					
Crude protein (%)	19.89	20.10	20.30	20.10	20.10
ME (Kcal/kg)	3004.01	2995.07	2997.30	2982.06	2964.10
Calcium (%)	1.00	1.00	1.00	1.00	1.00
Total phosphorus (%)	0.89	0.85	0.86	0.86	0.85
Ether extract (%)	8.41	8.30	8.15	7.96	7.80
Crude fibre (%)	4.60	4.60	4.60	4.60	4.60

**Table 3: Performance of Broilers Fed Experimental Diets at starter (0- 4 Weeks) and Finisher (5- 8 Weeks) Phases**

Parameters	DIETS					SEM
	A (0%)	B (25%)	C (50%)	D (75%)	E (100%)	
<b>Starter (0-4 weeks) phase</b>						
Daily feed intake	73.67 <sup>ab</sup>	73.89 <sup>ab</sup>	81.62 <sup>a</sup>	72.81 <sup>a</sup>	71.51 <sup>b</sup>	0.76*
Daily weight gain (g)	25.82 <sup>b</sup>	25.40 <sup>bc</sup>	29.20 <sup>a</sup>	29.65 <sup>a</sup>	24.50 <sup>c</sup>	0.87*
Feed conversion ratio	2.96	2.99	2.60	2.53	2.31	0.35 <sup>NS</sup>
Mortality (Number)	0	0	0	0	0	0
<b>Finisher (5-8 weeks) phase</b>						
Daily feed intake	186.76	172.80	173.25	173.50	189.30	2.68 <sup>NS</sup>
Daily weight gain (g)	65.01	65.56	66.87	69.22	65.15	1.79 <sup>NS</sup>
Feed conversion ratio	2.76	2.62	2.56	2.48	2.34	0.56 <sup>NS</sup>
Mortality (number)	3	5	8	8	9	0.52 <sup>NS</sup>

**Table 4: Gross Performance of Broiler Fed Experimental Diets (0 - 8 Weeks)**

Parameters	DIETS					SEM
	A (0%)	B (25%)	C (50%)	D (75%)	E (100%)	
Daily Feed Intake	115.36	114.80	114.98	115.20	115.29	1.30 <sup>NS</sup>
Daily Weight Gain (g)	41.72	42.09	42.61	50.06	43.53	2.15 <sup>NS</sup>
Feed Conversion Ratio	2.85	2.68	2.31	2.50	2.75	0.81 <sup>NS</sup>
Mortality (Number)	3	5	8	8	9	

**Note:** Means in the same row with different superscripts are significantly different ( $P < 0.05$ )

NS = Not Significant

SEM = Standard Error of the Mean

**Table 5: Economics Analysis of Experimental Diets on Performance of Broilers (1 Week)**

Ingredients	DIETS				
	A (0%)	B (25%)	C (50%)	D (75%)	E (100%)
Total Feed Intake (kg)	45.31	45.09	45.00	45.76	44.61
Feed Cost (N/kg)	45.31	45.09	45.00	45.76	44.61
Total Feed Cost (N/bird)	255.61	250.82	250.40	231.82	261.09
Total Weight Gain (kg)	2.25	2.35	2.70	3.02	2.86
Feed Cost (N/kg weight gain)	207.01	203.20	200.10	180.12	392.45

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**References** to this paper should be made as follows: Kperegbeji, J.I and Eneruvie, B.E. (2014), The Use of Palm Kernel Cake in Replacement of Maize on the Performance of Broiler Chickens Reared in Rainforest Zone, Nigeria. *J. of Agriculture and Veterinary Sciences*, Vol. 6, No. 1, Pp. 124 - 131.

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