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PERFORMANCE AND ECONOMICS OF BROILERS FED GRADED LEVELS OF FULL FAT PALM KERNEL MEAL DIETS

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ABSTRACT

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An eight week feeding trial was carried out with 144 Ross strain of broilers to determine the effect of graded levels of crushed full fat palm kernel meal (FFPKM) diets on performance and economics of broiler production. The chicks were randomly assigned to four experimental treatments each with 3 replicates in a completely randomised design and fed 0, 5, 7.5 and 10.2%; and 0, 7, 9.5 and 14.3% FFPKM diets at starter and finisher stages respectively. Each treatment had 36 birds with twelve birds per replicate. Data were collected on feed intake, weight gain and feed conversion ratio. On day 56, four birds per treatment were starved overnight and slaughtered to evaluate dressed weight and carcass characteristics. Results showed that inclusion of crushed FFPKM did not significantly affected live weight, weight changes, feed conversion ratio and dressed weigh. There were no effect ($p<0.05$) on carcass yield and cut parts. On the economics, there was no significant ($p<0.05$) effect on feed cost per gain, revenue per bird and gross margin per bird. Results show that crushed full fat palm kernel meal could be used up to 14.3% with no adverse effect on performance, carcass quality and economics of broiler production.

Keywords: *FFPKM; carcass; performance characteristics; benefit; broiler economics*

INTRODUCTION

Feed remains a major barrier to achieving full potential in poultry production. Up to 80% of recurrent cost of production is attributed to feed (Durunna *et al.*, 2005; Lalabe *et al*., 2012). Much of this cost stems from energy and protein concentrates principally maize, soybean, and fish meal and groundnut cake. This problem is further compounded by the direct competition existing in their use between humans, animals and industry (Appleby, 2008). Low availability, access and high cost of these ingredients have shifted emphasis to the use of non-conventional feed ingredients arising from agricultural waste and agro industrial by-products (Okeudo *et al*., 2005; Omotosho *et al*., 2012; George and Sese, 2012; Sese *et al*., 2014). Crop residues, oilseeds, meals and cakes in their full fat or partly expressed have been deployed in an effort to reduce heavy demand placed upon maize as an energy source for feeding poultry (Bello, 1984; Lalabe *et al*., 2012; Adeosun and Iyeghe-Erakpotobor, 2012).

Palm kernel is a bye-product of industrial palm oil processing (FAO, 2002) and is abundant in South South rain forest zone of Nigeria where Akwa Ibom state is located. Palm kernel could further be processed to derive a type of oil quite different from palm oil (Agunbiade *et al.,* 1999). Addition of oil in their pure form to poultry feed by farmers prior to feeding their birds is a widely adopted practice which imposes an extra cost to the formulation (Rahman *et al.*, 2010). The extra cost arises from competition between humans, animals and industrial uses of this oil. The assumption is that crushing full fat palm kernel into meal and adding directly to the feed can reduce the process and cost. Full Fat Palm Kernel Meal (FFPKM) is different from palm kernel cake (PKC) and is derived from crushing whole palm nut (endocarp) and the kernel with no oil extracted (Okeudo *et al.,* 2005). FFPKM is a concentrated source of energy when compared to PKC and contains 46 – 54 % DM of oil with metabolizable energy content of 6400 Kcal/kg (Oruwari *et al.,* 1996; Sese *et al*., 2014). Use of FFPKM also introduce crude fibre (13.38%), crude protein (11.26%) and oils for reducing dustiness and has been incorporated into broilers diet up to 35% with no negative effect on growth performance and carcass characteristics (Onwudike, 1986; Okeudo *et al.,* 2005; Sese *et al.,* 2014). Despite its potential as an alternative energy source not much information is available on nutritional value of FFPKM. The objectives of this work therefore were to determine the effect of replacing maize and PKM with graded levels of FFPKM on the performance characteristics and economics returns of broiler production.

MATERIALS AND METHODS

Study site

The site for this experiment was Hatch Your Own farm in Nsukara Offot, Uyo, Akwa Ibom State. Nsukara Offot is located in the rainforest zone of Nigeria.

Experimental designs and diets

One hundred and forty four day old unsexed broiler chicks of Ross strain were used in conducting the experiment which were randomly assigned four experimental diets (T1, T2, T3 and T4) each with 3 replicates in a completely randomized design and fed 0, 5, 7.5 and 10.2%; and 0, 7, 9.5 and 14.3% FFPKM diets at starter and finisher stages respectively. Each treatment had 36 birds with twelve birds in each replicate. The full fat palm kernel meal used in this study was derived from whole palm kernel with nut inside. The palm kernel was procured from a local mill at Nsukara Offot, Akwa Ibom State. The whole palm kernel with nut was crushed using hammer mill fitted with a 2.5 mm screen for the crushed ingredient to pass through. The ingredient was then added to the basal

diet at the levels of 0, 5.0, 7.5 and 10.2% at the starter phase and 0, 7.0, 9.5 and 14.3% at the finisher phase in order to replace maize and palm kernel cake. Table 1 presents the ingredients and calculated composition of the starter and finisher diets. The gross composition of the dietary treatment for both the broiler starter and finisher phases are shown in Table 1.

Maize content of T1which served as control diet at starter (51%) and finisher (53%) stages were gradually reduced for other treatments at 1% for (T2); 2% for (T3) and 3% for (T4). Similarly, PKC at starter stage (10.2%) was also gradually reduced by 5% for T2; 7.5% for T3 and 10.2% for T4. At the finisher stage PKC reduction was by 7% for T2; 9.5% for T3 and 14.3% for T4 from the control diets at respective stages. The crude protein for T1 starter diet was 22.2%. Crude protein for T2, T3 and T4 were 21.7, 21.7 and 21.7% respectively. Similar patterns were achieved at finisher stage by formulating CP to contain 20.1%; 19.6%; 19.6% and 19.6% for T1, T2, T3 and T4 respectively.

Table 1: Ingredients and nutrients composition of experimental starter and finisher broiler diets

Ingredients	Starter Phase				Finisher Phase			
(%)	T1	T2	T3	T4	T1	T2	T3	T4
Maize	51.0	50.0	49.0	48.0	53.0	52.0	51.0	50.0
Soybean meal	30.0	31.0	32.0	33.0	26.0	27.0	28.0	29.0
PKC	10.2	5.2	2.7	0.0	14.3	7.3	4.8	0.0
Fish meal	4.0	4.0	4.0	4.0	2.0	2.0	2.0	2.0
FFPKM	0.0	5.0	7.5	10.2	0.0	7.0	9.5	14.3
Bone meal	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Salt	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Lysine	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1
Methionine	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Vitamins/TM premix*	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Calculated nutrient Composition								
Crude protein	22.2	21.7	21.7	21.7	20.1	19.6	19.6	19.6
Crude fibre	4.5	4.4	4.3	4.2	4.7	4.5	4.4	4.3
Ether extract	8.5	4.9	5.3	5.7	4.2	5.3	5.7	6.5
ME (Kcal per kg)	2866.0	2997.0	3058.0	3125.0	2891.0	3080.0	3140.0	3267.0

*Vitamin premix supplied (per kg diet): vitamin A = 10,000 IU; vitamin D_3 = 12,000 I.U.; vitamin E = 20 I.U.; vitamin K = 2.5 mg; Riboflavin = 3.0 mg; Thiamain = 2.0 mg; Pyridoxine = 4.0 mg; cobalamin = 0.05 mg; vitamin B_{12} = 0.01 mg; panthotenic acid = 5 mg; nicotinic acid = 20 mg; folic acid = 0.5 mg; choline = 0.2 g; manganese = 0.006 g; iron = 20 mg; copper = 0.006 g; zinc = 0.03 g; cobalt = 0.25 g; iodine = 0.0014 g, anti-oxidant = 0.25 mg, biotin = 0.08 mg; selenium = 0.24 mg.
PKC = Palm kernel cake, FFPFM = Full fat palm fruit meal, ME = Metabolizable energy.

Management of experimental birds

Following thorough cleaning and disinfecting, twelve partitions known as replicates were created from the experimental area for each to accommodate 12 birds (total 144) of Ross strain. Two days prior to birds arriving, the floor was covered with wood shavings to the thickness of about 5cm. On arrival, each bird was weighed and randomly allocated to four treatments, with each treatment having 3 replicates housing a total of 36 birds. The birds went through brooding for the first 21 days and were cared for using standard procedures for management and vaccinations.

Statistical and economic benefit analysis

All generated data were subjected to analysis of variance and means that showed significant difference were separated using Duncan new Multiple Range Test according to Steel and Torrie (1980). Economic analysis was applied to determine the economic implications of adding full fat palm kernel meal to broiler diet. Economic parameters that were deployed in the analysis were cost per kg feed, feed cost per bird, feed per weight gain, revenue per bird and gross margin per bird.

RESULTS AND DISCUSSION

Growth performance

The effect of crushed full fat palm kernel diets on the growth performance of broilers (Table 2) shows that there were no significant differences ($p>0.05$). This implies that crushed full fat palm kernel diet had no influence on the average parameters for live weight, weight changes, feed intake and feed: gain ratio. However, T4 diets with 14.3% inclusion of crushed FFPKM recorded the lowest value for feed intake and highest value for feed conversion ratio compared to other treatments. The implication for this result is that the inclusion of FFPKM in the diets did not have any negative effect on the growth performance of broiler chickens and can be used to produce broiler chickens. The highest average daily feed intake recorded for T1 may explain effort by the birds to consume sufficient energy for optimum performance (Tooci *et al*., 2009). Compared to T4, treatments 1, 2 and 3 were less efficient in feed conversion ratio.

Table 2: Growth performance of finisher broiler chickens fed crushed full fat palm kernel meal diets

Parameters	T_1	T_2	T_3	T_4	SEM
Fasted live weight (g)	2400.0	2233.3	2250.0	2266.7	37.4
Weight Changes (g)	189.9	191.9	196.9	186.2	5.2
Feed Intake (g)	120.0	119.5	118.6	116.4	10.9
Feed conversion ratio	0.5	0.5	0.4	0.8	2.3

SEM = standard error of the means. T1= 0 % FFPKM, T2= 7.0 % FFPKM, T3= 9.5 % FFPKM, T4= 14.3 % FFPKM.

Carcass yield

The effect of FFPKM on experimental broilers was determined by setting parameters for assessing carcass yield and characteristics (Table 3). These parameters (dressed weight, breast cut, thigh, drum stick, wing and abdominal fat) showed no significant difference. No significant difference was recorded in fat deposition, instead T1 and T3 showed the highest values for fat. This was contrary to reports by previous researchers (Sese *et al*., 2014; Raju *et al.*, 2014), who reported higher fat deposition with increase dietary energy. The result on carcass characteristics suggests that higher inclusion of FFPKM in broiler diet did not negatively affect or bring about excess fat deposition.

Table 3: Carcass yield of broiler chickens fed full fat palm kernel meal

Parameters	T_1	T_2	T_3	T_4	SEM
Dressed weight (g)	2155.8	1960	2041.1	2072.2	38.4
Breast cut (g)	528.3	494.8	524.9	515.8	12.8
Thigh (g)	841.7	821	821.3	919.3	30.2
Drumstick (g)	704.7	705.7	679.7	699.3	14.2
Wing (g)	582.7	564	567.7	575.7	9.8
Abdominal Fat (g)	107.3	67.7	107.3	70.7	9.6

SEM = standard error of the means. T1= 0 % FFPKM, T2= 7.0 % FFPKM, T3= 9.5 % FFPKM, T4= 14.3 % FFPKM.

Economics of returns

Parameters were set for determining the economics of broiler chicken fed FFPKM diets (Table 4). Addition of FFPKM led to marginal but progressive increase in the cost per kg of feed due to increasing level of FFPKM in the diets. Treatment 1 recorded the lowest feed cost per bird and feed cost per kg (N). Results showed no significant difference across treatments for revenue and gross margin. However, steady increases were recorded for revenue per bird with increasing level of FFPKM in the diet. Treatment 4 recorded the highest revenue and gross margin per bird followed by T3 in those two parameters. The highest feed intake recorded for T1 (Table 2) may have depressed revenue per bird and gross margin.

Table 4: Economics of broiler chickens fed full fat palm kernel meal

Parameters (N)	T_1	T_2	T_3	T_4
Cost per kg feed	97.9	143.5	151.6	162.1
Feed cost per gain	470	717	621	778
Feed cost per bird	548	802	847	906
Revenue per bird	1360	1593	2185	2247
Gross margin per bird	812	791	1338	1341

T1= 0 % FFPKM, T2= 7.0 % FFPKM, T3= 9.5 % FFPKM, T4= 14.3 % FFPKM

CONCLUSION

This study enabled the achievement of a major objective of reducing the metabolisable energy with increasing FFPKM in the diets for broilers. The feed intake of birds in the control group was higher than that of other groups. This study shows that broilers could be reared on ration containing up to 14.3% palm kernel meal, with no adverse effects on parameters such as growth performance, carcass characteristics, gross margin and revenue per bird. It would be interesting to assess the impact of enzyme interaction with FFPKM in growth performance and economics as well. This study shows that the inclusion of up to 14.3% FFPKM may successfully serve as an alternative to maize and PKC.

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