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EFFECTS OF DIFFERENT LEVELS OF PALM KERNEL CAKE ON DIGESTIBILITY AND CARCASS CHARACTERISTICS OF BROILERS

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ABSTRACT

Palm kernel cake (PKC) is an agricultural by-product which is regarded as sources of both carbohydrate and protein and incorporated in animals feed help reduces the cost of production. This study examines the replacement of PKC at different level (0, 10, 15, and 20%) in the diet of 120 broiler birds. The birds were raised on commercial feed for two weeks and allotted to four treatments of 30 birds each and replicated 3 times in a complete randomize design. Data were collected on feed intake, weight gain, carcass characteristics and nutrient digestibility. The result showed that the live weights were significantly ($p<0.05$) lower in birds fed 20% (T_4) PKC than control diet (T_1). There was an increase in the size of gizzard with increasing level of PKC but thigh, leg, chest, neck, intestine, trunk, liver and heart were not significant ($p>0,05$) among treatments. The result of the nutrient digestibility reveals that crude protein was significantly ($p<0.05$) different between the control diet (T_1) and other treatment (T_2, T_3 and T_4). Ether extract was high and showed no significant ($p>0, 05$) differences among treatments. It was therefore concluded that, PKC can be incorporated up to 20% in broilers finisher ration without compromising the birds' performance.

Keywords: Palm kernel cake, Digestibility, Carcass characteristics, Broilers, Finisher, Nutrient

INTRODUCTION

There is need to investigate the use of palm kernel cake (PKC) in order to ascertain its cost effectiveness when compared to conventional feed stuffs (World Poultry Science, 2006). There has been a dramatic increase in global production of PKC with annual growth of 15% over the last two decades (Food and Agricultural Organizations, 2002). Palm kernel cake is aflatoxin free,

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palatable and has considerable potential as a carbohydrate and protein source. However, due to deterioration and unhygienic condition a large amount of PKC is usually discarded. This is a problem for palm kernel producing countries such as Indonesia and Malaysia which will create environmental problems in the future (World's Poultry Science 2006).

The use of PKC in broilers diets has been practiced for several decades but because of its low level of key essential amino acids (lysine & methionine in particular), high dietary fibre and grittiness have precludes its inclusion in poultry diets. Contradictory results have been reported on the effects of PKC on the performance of broilers (Ezieshi and Olumo, 2004) Problems created by the use of PKC may not be related to the physical properties of PKC but to its contribution to the overall nutrients in the diet, particularly amino acids and metabolizable energy. There has been increased interest in the use of PKC over the years due to its efficacy in improving the immune system of broilers (World's Poultry Science, 2006).It is expected that as the demand for animal protein increases with increasing population and improvement in living standard, conventional feed stuffs are likely to be insufficient to sustain monogastric animal production.

STATEMENT OF PROBLEM

Livestock feeds have become very expensive resulting in decrease in livestock production. Also the increasing competition between man and livestock for available feedstuff calls for alternative feedstuffs to arrest feed crises in the livestock industries such as the use of by-products from palm kernel, cocoa, coconut (copra meal) and others, to cut down feed prices thus makes them more affordable to livestock farmers. The potential of PKC in improving poultry production has not been fully explored and the need to determine the right level of PKC to utilizein order to reduce the cost of poultry feed production and make poultry products such as eggs and meat available and affordable for human consumption.

JUSTIFICATION OF THE STUDY

PKC which contains no-anti nutritional factors can be beneficially included in the diet of poultry. Its inclusion in the feed of broilers can be maximized provided that the diet is balanced particularly in amino acid and metabolizable energy to give a positive effect on body weight of broilers which in the long run encourage farmers.

According to Oluwafemi (2008), the benefit of PKC utilization lies on its nutrient composition (dry matter and crude protein). However, it has been severally reported that the availability of these nutrients for use by the animals depend on the method of oil extraction. A high quality PKC is desirable to foster sustainable animal production in Nigeria.

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OBJECTIVES OF THE STUDY

The overall objective of the studyis to examine the effects of inclusion of different levels of palm kernel cake (PKC) on digestibility and carcass yield of broilers.

The specific objectives of the study are to:

i. Determine the effect of the inclusion of palm kernel cake on the digestibility of diet of broilers.
ii. Compare the performance of broiler feed at different inclusion level of palm kernel cake.

Table 1: Proximate composition of palm kernel cake

Composition	Percentage (%)
Crude protein	18.8
Crude fiber	11.0
Ether extracts	7.0
Ash	4.8
NFE	58.4
Total	**100.00**

Source: Aduku (1993)

MATERIAL AND METHODS

Experimental site

The study was carried out at the Poultry Unit of the Department of Agricultural Education, Federal College of Education, Kontagora, Niger State, Nigeria. The experiment was conducted in floor pens with wood shavings in an environmentally controlled pen.

Experimental birds

One hundred and twenty (120) day-old broiler chicks were raised together for the first two weeks, fed with commercial feed (starter mash) and vaccinated against gumboro and Newcastle diseases (starter phase). At the end of the starter phase, the birds were gradually introduced to the experimental feed(diet) and were randomly divided into four experimental units (T_1 , T_2, T_3, T_4,)

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of 30 chicken with three replicates for each treatment (10 birds per replicate). Adequate hygiene was ensured to avoid the buildup of any disease condition.

The experimental design was completely randomized design (CRD)and the treatments were the inclusion of palm kernel cake (PKC) at 0, 10, 15& 20% for T_1, T_2, T_3 and T_4 respectively. The birds were fed with known quantity of feed and water was provided ad-libitum throughout the experimental period.

Sources of palm kernel cake

The palm kernel cake and other ingredients used throughout the period of the experiment were sourced from Minna, Niger State, Nigeria.

Table 2: Composition of experimental diet

Item	T_1	T_2	T_3	T_4
Maize	66.07	58.93	55.36	51.79
PKC	0.00	10.00	15.00	20.00
Soybeans	26.43	23.57	22.14	20.71
Bone meal	2.00	2.00	2.00	2.00
Salt	0.50	0.50	0.50	0.50
Fish meals	5.00	5.00	5.00	5.00
Total	**100.00**	**100.00**	**100.00**	**100.00**

T_1= 0% Inclusion of PKC

T_2 = 10% Inclusion of PKC

T_3 = 15% Inclusion of PKC

T_4 = 20% Inclusion of PKC

Data collection

Data were collected on performance (feed intake and weight gain). A known quantity of feed was supplied daily and left over weighed. Feed intake was determined by differences between

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feed served and the left over. Birds were weighed weekly and weight gain calculated by differences between two consecutive weighing while the final gain calculated by the differences between the initial and final weight.

Faecal collection

At the 7th week of the experiment, four birds were randomly selected per replicate and assigned to different apartments for digestibility trial. Faeces were collected for 24hours for a period of 3days at the 7th week of the feeding trial. The faeces were dried in the laboratory oven at 60^0C and ground to pass through a 1mm mesh screen for the laboratory test at the Department of Animal Production, School of Agriculture and Agricultural Technology, Federal University of Technology Minna, Niger State, Nigeria.

Data were collected on faecal sampled and analyzed for a proximate composition to determine the digestibility.

Nutrient digestibility was calculated as:

$$\frac{\text{Amount of nutrient in the feed} - \text{Amount of nutrient in feces}}{\text{Amount of nutrient in the feed} \times 1} = 100$$

Carcass analysis

Carcass yield was evaluated with one chicken per replicate randomly selected to reflect the average weight of the group. The final weights of the birds selected were recorded after the animals were allowed to fast overnight prior to slaughtering. The birds were slaughtered by seizing their legs, stretched across a chopping block, cut through the neck and allowed to bleed for 20 minutes. The carcasses were dressed by removing the feathers. All the primal parts and internal organs were removed and weighed and were expressed as percentage of live weight.

Statistical analysis

All the data collected were subjected to analysis of variance using MINITAB 17 Statistical Package and the mean were separated using FISHER LEAST Significant Difference test (FLSD) at 5% level of significance.

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RESULTS AND DISCUSSIONS

Table 3: Proximate compositions of the experimental diets

	MC (%)	CP (%)	CF (%)	ASH (%)	FAT (%)	NFE (%)
T_1	7.70	25.45	11.33	6.00	12.00	37.52
T_2	7.30	24.05	11.36	5.60	13.00	38.72
T_3	7.70	25.75	8.00	5.50	10.00	40.05
T_4	7.70	25.10	7.50	7.50	11.50	38.03

Table 4: Proximate compositions of the faeces

	MC (%)	CP (%)	CF (%)	ASH (%)	FAT (%)	NFE (%)
T_1	8.40	27.44	19.67	16.00	6.00	22.49
T_2	8.20	27.38	18.11	16.00	5.00	25.31
T_3	8.00	27.04	20.67	14.00	6.00	23.95
T_4	8.00	27.90	14.00	14.00	7.50	22.12

Effects of different levels of inclusion of palm kernel cake on nutrient digestibility of broiler

Result of the nutrient digestibility of broilers fed diet containing different levels of palm kernel cake are presented in Table 5. The crude protein digestibility was significantly different ($p<0.05$) between treatments with values of 70.12, 65.02, 62.19, and 58.67 for T_1, T_2, T_3 and T_4 respectively. Crude fiber was 28.42, 41.73, 46.15, and 49.51, respectively among the treatment means. Ether extract (EE) and NFE were not significantly affected ($p>0.05$) by PKC inclusion in the diets of broilers. Digestibility of Ash was significantly affected ($p<0.05$) among the treatment means. It ranges from 20.24 in T_2 and 40.97 in T_4. T_1 and T_3 had the values of 23.45 and 23.22 respectively

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Table 5: Effects of different levels of inclusion of palm kernel cake on nutrient digestibility of broiler

Parameter	T_1	T_2	T_3	T_4	SEM	LS
CP (%)	70.12^{a}	62.19^{b}	65.02^{ab}	58.67^{b}	2.05	*
CF (%)	49.51^{a}	46.15^{ab}	28.42^{c}	41.73^{b}	2.20	*
EE (%)	85.42	87.35	81.83	77.51	2.23	NS
ASH (%)	23.45^{b}	20.24^{b}	23.22^{b}	40.97^{a}	3.09	*
NFE (%)	80.86	78.91	80.47	80.47	1.10	NS

Effects of different levels of inclusion of palm kernel cake on the carcass characteristics of broiler

The result of the live weight and the carcass characteristics of broiler fed diet containing different inclusion levels of palm kernel cake are presented in Table 4.4 The result showed that different inclusion levels of palm kernel cake in the diet had significant ($p<0.05$) effects on the live weight of the birds. There were no significant ($p<0.05$) difference in leg, thigh, chest, neck, intestine, liver, trunk and heart of the birds. The values obtained from forelimbs are higher in T_2 and T_4 birds than in T_1 and T_3 birds. Values of the head ranged from 2.48% to 2.99% among treatments. The weight of the Gizzard ranged from 1.87 to 2.38%. The highest value for crop was observed in T_3 with 4.86% and lowest in T_4 with 3.25%.

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Table 6: Effects of different levels of inclusion of palm kernel cake on carcass characteristics of broilers.

Parameters	T_1	T_2	T_3	T_4	SEM	LS
Live weight (g)	2266.7^{a}	2100.0^{ab}	2200.0^{ab}	1966.7^{b}	79.93	*
Leg	4.74	5.05	4.57	5.19	0.27	NS
Thigh	23.19	21.81	23.67	22.32	1.12	NS
Fore-limbs	8.42^{b}	9.14^{ab}	8.43^{b}	9.87^{a}	0.28	*
Chest	17.81	19.71	17.34	17.92	0.87	NS
Neck	6.11	5.73	5.47	6.21	0.38	NS
Head	2.48^{b}	2.70^{ab}	2.52^{b}	2.99^{a}	0.11	*
Intestine	7.19	6.81	6.80	6.84	0.31	NS
Liver	1.89	1.71	1.85	1.76	0.12	NS
Gizzard	1.91^{b}	2.02^{b}	1.87^{b}	2.38^{a}	0.10	*
Trunk	15.85	15.50	15.80	16.20	0.32	NS
Crop	3.78^{ab}	4.28^{ab}	4.86^{a}	3.25^{b}	0.40	*
Heart	0.44	0.42	0.35	0.41	0.03	NS

DISCUSSION

The digestibility of CP, NFE and EE higher among the treatments could be attributed to the ability of the older birds to utilize the feed efficiently. This agrees with Sundu *et a*l. (2005) who opined that metabolisable energy increase as PKC level increases, an attribute of the older birds to digest fats and protein and ingest more fibrous feed. There was a slight reduction in the digestibility of crude fibre at 15% inclusion of PKC but it rises when 20% PKC was included.

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However, Cherrurat et al. (2011) reported that birds adjust their feed intake to obtain a constant energy intake.

The broilers fed 15% and 20% PKC recorded the lowest live weight than birds fed with 10% PKC and control. This could be as a result of its higher quantity of crude fibre and lignin (Boateng et-al., 2008). This is in line with Zanu et-al. (2011) who reported reduction `in weight of birds with increasing PKC to 15% in diets as attributed to a lower nutrient digestibility with PKC inclusion. The size of gizzard of the birds increases with increasing level of PKC. This is in agreement with Fesina et-al. (2004), Okeado et-al. (2005) and Soltan. (2009) who reported that the increasing size of Gizzard as PKC levels increases may be due to high fibre content of the PKC. The weight of legs, thigh, chest, neck, intestine, liver, trunk and heart were not significantly affected ($P>0.05$) by increasing levels of PKC compare to those fed control diet. This indicates that broilers can utilize PKC efficiently without adverse effect on the internal organs.

CONCLUSION

Palm kernel cake as an industrial by-product will continue to play an important role in the feed industry in the world. However, PKC can be included up to 20% level in broilers diet without any adverse effect on their production performance because broilers can utilize PKC.

RECOMMENDATIONS

From the results of this research the following are therefore recommended;

i. That; the inclusion of PKC up to 20% level does not constitute any negative effects on the birds.
ii. That; other studies should be carried out to investigate levels above 20% inclusion and their effects on broilers.

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