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Effects of High Levels of Palm Kernel Cake on Performance and Carcass Characteristics of Finisher Broilers

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Abstract
A total of 144 broiler chicks (Marshal breed) that were raised to 28 days of age on broiler starter diets containing 0.0 % - 30.0 % levels of palm kernel cake (PKC) were used in this study to investigate the effects of high dietary inclusion levels of PKC on the performance, cost implication and carcass characteristics of finisher broilers. Four dietary treatments designated as T_1, T_2, T_3,and T_4 were used such that diet 1 (control diet) contained 30.0 % PKC; diets 2, 3 and 4 contained 35.0, 40.0 and 45.0 % PKC levels, respectively. 36 broiler chicks were allotted to each treatment group which was subdivided into three replicates of 12 birds each, in a completely randomized design. The experiment lasted four weeks and was terminated when the birds were 56 days of age. Results of the experiment showed significant superiority ($p< 0.05$) in the average final live weight of birds on 30.0 % and 45.0 % PKC dietary levels over the birds on 35.0 % and 40.0 % PKC dietary levels, while all other parameters were similar ($p> 0.05$) across dietary treatments. It was concluded that finisher broilers could be profitably raised on 45 % PKC dietary inclusion levels without adverse effects on performance.

Keywords: Broilers, palm kernel cake, carcass characteristics

Introduction

Poultry products (meat and eggs) have been considered sure options for reducing the incidence of malnutrition, particularly protein deficiency in diets of Nigerians (Omoikhoje *et al*., 2017). As a result of this, poultry production is the fastest growing animal production sub-sector in Nigeria (Ajakaiye *et al*., 2010). However, feed availability remains the challenging problem facing the industry in the tropics,due to the scarcity and high cost of the conventional protein and energy feed raw materials (Isika *et al.,* 2006). A means of reducing the rising cost of feed resources is the use of agro-industrial by-products such asbrewer's grains, cassava peels andpalm kernel cake (PKC).

PKC has recently been used in livestock feeding in Nigeria. Dietary inclusion of PKC in pullet diets at 20 and 40% levels resulted in superior daily gains compared to the 0% level (Egenuka *et al*., 2013). None of the performance criteria was affected but thecost of feed consumed significantly decreased with increase in PKC levels when starter broilers were fed up to 30% PKC diets (Egenuka *et al*., 2018). Thus, the large quantities of PKC produced in Nigeria could prove valuable in reducing the feeding cost of livestock and poultry.

This study was, therefore, designed to evaluate the effect of high dietary levels of PKC on performance, cost implication and carcass characteristics of finisher broilers.

Materials and Methods

This study was conducted at the Teaching and Research Farm of Federal University of Technology, Owerri, Imo state, Nigeria. Owerri is situated in the south-eastern agro-ecological zone of Nigeria. A total of 144broiler chicks (Marshal breed) that were raised to 28 days of age on broiler starter diets containing 0 - 30% levels of PKC were used in this study which was terminated when the birds were 56 days of age. The birds were randomly divided into four treatment groups of 36 birds, each treatment comprising of three replicates of 12 birds in a completely randomized design (CRD). The birds were weighed individually at the start of the experiment and weekly thereafter until the end of the experiment. Feed and water were offered *ad-libitum*, while other management and health programs were strictly adhered to.

Four experimental diets (T_1, T_2, T_3,and T_4) were formulated, each for one of the four experimental groups of birds. T_1 (control diet) contained 30% PKC level, while T_2, T_3,and T_4 contained 35, 40 and 45% PKC levels, respectively.The diets were formulated to provide 19.91 – 20.14 % crude protein and 2876.00 – 2894.21 kcal/kg metabolizable energy (ME). The ingredient and calculated chemical composition of the experimental diets are presented in table 1.The birds were weighed at the beginning of the experiment and weekly thereafter until the end of the experiment (56 days of age). Feed consumption was recorded daily and was obtained as the difference between the quantity of feed offered and the quantity remaining the next morning.

Data obtained were used to calculate daily weight gain, daily feed intake and feed conversion ratio (FCR). Cost of feed consumed was calculated and used to determine feed cost per kilogram weight gain. At the 56th day, 12 birds, one from each replicate weighing between 2000 and 2240 g were selected and slaughtered for carcass analysis. They were sacrificed, dressed and cut into different parts. The weight of the dressed carcass, carcass, and organ parts were recorded.

Table 1: Ingredient composition of experimental broiler finisher diets

Ingredients	Diet 1 (30.0% PKC)	Diet 2 (35.0% PKC)	Diet 3 (40.0% PKC)	Diet 4 (45.0% PKC)
Maize	46.00	43.50	43.00	39.00
Palm kernel cake	30.00	35.00	40.00	45.00
Soybean meal	9.00	6.00	4.00	3.00
Blood meal	4.00	5.00	4.00	7.00
Fish meal	2.00	2.00	2.00	1.00
Spent grain	3.50	3.50	2.00	0.50
Wheat offal	1.00	1.00	1.00	1.00
Bone meal	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25
Vit/min premix*	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculatedchemical composition				
Crude protein	19.96	19.91	20.14	20.10
Metabolizableenergy (ckal/kg)	2894.21	2886.90	2890.22	2876.00
Crude fibre	5.75	6.02	6.24	6.95
Crude fat	4.75	5.35	5.03	4.99
Calcium	1.27	1.25	1.28	1.26
Phosphorus	1.00	1.02	1.03	1.02
Ash	3.36	3.40	3.40	3.38

*Biomix broiler finisher premix: a high potency and trace mineral premix formulated to provide vit. A, 8,500,000 iu; vit. D_3 1,500,000 iu; vit. E 10,000 mg; vit. K_3 1500 mg; vit. B_1 1600 mg; vit. B_2 4000 mg; niacin 20,000 mg; pantothenic acid 5,000 mg; vit. B_5 1,500 mg; vit B_{12} 10 mg; folic acid 500 mg; biotin 750 mg; choline chloride 175, 000 mg; cobalt 200 mg; copper 3000 mg; iodine 1000 mg; iron 20, 000 mg; manganese 40,000 mg; selenium 200 mg; zinc 30,000 mg; antioxidant 1,250 mg per ton of feed.

The data collected were subjected to analysis of variance (ANOVA) using the completely randomized design (CRD). Significant differences in treatment means were separated using Duncan's New Multiple Range Test (DNMRT) as outlined by Obi(1990) at 5% level of probability.

Results and Discussion

Performance of the finisher broilers fed the different PKC diets is shown in table 2 while the carcass characteristics are shown in table 3. The birds on the control diet had the highest average final live weight, which was similar to the average weight of the birds on 45% PKC but differed significantly ($p< 0.05$) from those of the birds on 35% and 40% PKC diets respectively. Average weight gain, daily feed intake, and FCR were similar across dietary treatments. Egenuka *et al.* (2013) reported that dietary inclusion of PKC at 20 and 40% levels in pullet diets resulted in superior final live weight and daily weight gains compared to the 0% level. The result of our study, however, disagrees with the reports of Okeudo *et al.* (2005) that differences in final live weight were not statistically significant in finisher broilers fed 0.0 - 30.0% PKC diets.

Table 2: Performance of finisher broilers fed different levels of palm kernel cake (PKC) diets.

Parameters	PKC Levels (%)				
	30	35	40	45	SEM
Av. initial liveweight (g)	871.67	897.01	904.48	911.11	33.65
Av. final liveweight (g)	2012.00^{a}	1719.35^{b}	1755.33^{b}	1837.35^{ab}	52.66
Av. weight gain (g)	1140.33	882.33	850.85	959.56	62.22
Growth rate (g/day)	40.73	31.51	30.39	34.27	2.20
Av. daily feed intake (g)	146.67	136.66	142.10	148.92	155.38
Feed conversion ratio	3.60	4.42	4.70	4.37	0.11
Cost of feed consumed (₦)	306.77	269.02	265.11	266.80	-
Feed cost/kg gain (₦)	269.02	304.90	311.58	278.04	-

^{a,b} Means within a row with different superscripts are significantly different ($P < 0.05$).

Av = Average

Cost of feed consumed and feed cost per kilogram weight gain were also not significant and did not follow a definite trend. The non-significant effect of PKC on the cost of feed consumed observed in this study was contrary to the observations in the starter phase (Egenuka *et al*., 2018) where the cost of feed consumed by the broilers significantly decreased as PKC levels increased.

Carcass and organ weights were similar across the dietary treatments. This means that high levels of PKC have no negative effect on carcass proportions. Our result is contrary to the findings of Okeudo *et al.* (2005) who reported that carcass weight, dressing percentage,and percent drumstick contents were similar across dietary groups but percentage head and shanks contents were significantly lower in broilers fed up to 30 % PKC diets and all broilers with PKC in their diet had significantly increased gizzard size. Bello *et al.* (2011) also noted that there was thenon-significant effect on most of the organs when broiler chicks were fed diets containing up to 40 % palm kernel meal (PKM).

Table 3: Effect of different levels of palm kernel cake diets on carcass characteristics of finisher broilers

Parameters	PKC Levels (%)				SEM
	30 35 4045				
Live weight (g)	2041.67	2113.33	2000.00	2066.67	55.50
Plucked weight (% LW)	92.11	92.59	91.28	93.71	0.69
Dressed weight (% LW)	57.81	59.85	57.68	60.14	1.18
Cut-up parts (% LW)					
Head	2.32	2.34	2.62	2.23	0.14
Leg	10.50	10.28	10.62	10.50	0.11
Thigh	5.20	5.26	5.52	5.44	0.25
Drumstick	5.30	5.02	5.13	5.24	0.15
Shanks	4.06	3.85	4.18	3.41	0.18
Visceral organs (% LW)					
Heart	0.39	0.45	0.53	0.45	0.04
Liver+gall bladder	2.50	2.33	2.32	2.36	0.13
Full gizzard	4.45	4.41	4.33	3.64	0.22
Empty gizzard	2.88	2.38	2.50	2.34	0.31
Intestines	5.45	5.76	6.22	5.67	0.42

LW=Live weight

Conclusion

It was concluded that finisher broilers could be profitably raised on 45 % PKC dietary inclusion level without adverse effects on performance.

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