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Effects of High Dietary Levels of Palm Kernel Cake on Performance and Cost of Production of Starter Broilers

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Abstract
A total of one hundred and forty-four (144), 7–day old broilers of Marshal Breed which have been raised on proprietary broiler starter mash for one week were used in this experiment to investigate the effects of high dietary inclusion levels of palm kernel cake (PKC) on performance and cost of production of producing starter broilers. Four dietary treatments designated as T_1, T_2, T_3 and T_4 were used such that T_1 (control diet) contained 0% PKC; diets 2, 3 and 4 contained 10, 20 and 30% PKC levels, respectively. Each treatment group was allotted 36 broiler chicks and was subdivided into 3 replicates of 12 birds per replicate in a completely randomized design. The experiment lasted 3 weeks. Results of the experiment showed that differences in PKC levels did not affect ($p>0.05$)any of the performance data but the cost of feed consumed significantly ($p<0.05$) decreased with increase in PKC levels. It was concluded that starter broilers could be fed 30% PKC diets with significantly reduced feed cost and no adverse effect on performance data.

Keywords: Palm kernel cake, starter broilers, performance, cost implications

Introduction

The consumption of quality food prevents the occurrence of malnutrition among the populace. This is usually achieved through the adequate inclusion of animal protein in food and making it easily available for consumption to all and sundry. Meat is a good source of essential amino acids and also supplies vitamins, minerals, and essential fatty acids. It is relied upon to contribute a major proportion of these dietary essentials in balanced diets. Peace *et al.* (2002) noted that protein intake of the average Nigerian both in quality and quantity is inadequate. Intake of 35 g out of the required minimum of 65-72 g of protein in the diet of an average man should be obtained from animal products (Bello *et al.*, 2016). However, only 8.4g out of the 53.8g of protein consumed per head per day in Nigeria comes from animal sources (Allison-Oguru, 1992). Poultry production plays a major role in bridging the animal protein gap in developing countries where average protein consumption is far below the recommended standard (Onyimonyi and Ernest, 2009). This is because poultry production enterprises are the fastest growing industries in the animal production sub-sector particularly in tropics and sub-tropics (Daghir, 2008; Ajakaiye *et al.*, 2010).

Feed availability remains the most challenging problem facing the poultry industry in the tropics (Girma *et al.*, 2011) due to scarcity and high prices of the conventional protein and energy sources for livestock production. Feed cost alone represents 70 - 80% of the total cost of poultry production (Esonu, 2000, Ukachukwu *et al.*, 2000). There is, therefore, the need to look for alternative cheaper sources of feedstuffs for the poultry industry. Presently, some agro-industrial by-products such as palm kernel cake (PKC), wheat bran, cassava peels and brewer's grains occupy a good position as alternative cheaper feedstuffs and have been incorporated in animal feeds with very good results. Recently, PKC has been used in feeding animals in Nigeria. It has been found that starter and grower pullets can be fed PKC at 34% and 38 % dietary levels respectively, without incurring any significant reduction in growth performance (Onwudike, 1986a). The inclusion of PKC in pullet diets at 20% and 40% levels resulted in superior daily weight gains compared with the 0% level (Egenuka *et al.*, 2013). Starter and finisher broilers were able to utilize PKC diets at 28% and 35% levels without deleterious effects on production (Onwudike, 1986b). Nigeria produces large quantities of PKC which have proved valuable in reducing the cost of feeding livestock and poultry.PKC is increasingly available from large commercial oil millers and the small and local crushers and is now well entrenched as a major feed ingredient in poultry feeds in the country.

This study was, therefore, conducted to investigate the effect of high dietary levels of palm kernel cake on theperformance of broiler chickens.

Materials and methods

One hundred and forty-four (144) 7-day old broilers of Marshal Breed were used in this experiment. They were procured at day old, brooded on deep litter and fed a proprietary broiler starter mash for one week before the commencement of the experiment. After the first week, birds were weighed and randomly divided into four treatment groups, each comprising of three replicates. Each of the four treatment groups had a total of 36 birds and each replicate a total of 12 birds. Each replicate was kept in a pen measuring 1m x 1m. Feed and water were provided *ad-libitum*. Conventional vaccination programs were observed including the administration of prophylactics such as antibiotics and coccidiostats. 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 0.00 % PKC level, while T_2, T_3, and T_4 contained 10, 20 and 30 % PKC levels, respectively. The diets were formulated to provide 22.26 - 22.45 % crude protein (CP) and 2821.34 - 2884.11 kcal/kg metabolizable energy (ME). The ingredient and calculated chemical composition of the starter diets are presented in table 1.

Table 1:Ingredient and calculated chemical composition of the experimental broiler starter diets

	Levels of palm kernel cake (PKC)			
Ingredients (%)	T1 (0% PKC)	T2 (10% PKC)	T3 (20% PKC)	T4 (30% PKC)
PKC	0.00	10.00	20.00	30.00
Maize	54.00	48.00	44.00	39.00
SBM	27.00	25.00	19.00	14.00
Blood meal	2.00	2.00	3.50	5.00
Fish meal	2.00	1.00	2.00	2.00
Brewers' dried grain	5.00	7.00	4.50	4.00
Wheat offal	6.00	3.00	3.00	1.00
Bone meal	3.00	3.00	3.00	3.00
Vitamin premix	0.25	0.25	0.25	0.25
Salt	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
Calculated chemical composition				
Crude protein (%)	22.44	22.31	22.26	22.45
Crude fibre (%)	6.45	5.18	5.53	5.98
Crude fat (%)	3.95	3.38	4.48	4.71
Calcium (%)	1.23	1.23	1.27	1.29
Phosphorus (%)	0.98	0.99	1.02	1.12
Ash (%)	3.37	3.39	3.57	3.64
Metabolizable energy (kcal/kg)	2884.11	2825.49	2821.34	2882.63

Bio mix broiler starter premix: a multivitamin and mineral premix formulated to provide vitamin A, 10,000.000.00 I.U;Vit D_3, 2,000.000.00 i.u; Vit E. 23,000.00mg;vit. K, 2,000.00; copper, 3.000.00mg; iodine; 1000.00mg; iron, 20.000.00mg; manganese, 40,000.00mg; selenium, 200.00mg; zinc, 3000.00mg; antioxidant, 1250.00mg.pertone of feed.

The birds were weighed at the beginning of the experiment and weekly thereafter until the end of the experiment at 4 weeks of age. Feed consumption was recorded daily and this was obtained as the difference between the quantity of feed offered in the morning 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. 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 as outlined by Obi (1990) at 5% level of probability.

Results and Discussion

The performance of the starter broilers fed the different PKC diets are shown in table 2.The birds on the control diet (0.0% PKC) numerically had the highest final live weight (884.05g) and weight gain (775.64g) at the end of the trial period. This was followed by 20.0% PKC, 30.0% PKC and 10.0% PKC groups respectively with values of 790.17g, 785.25g and 780.79g for the final live weight and 678.93g, 674.94g and 666.78g for the weight gain. Average daily weight gain also followed the same trend. However, there were no significant differences in these parameters. There were also no differences in feed intake and feed conversion ratio. Cost of feed per kg live weight gain was similar ($p > 0.05$) but the cost of feed consumed by the birds was significantly higher ($p < 0.05$) in the control group (0.00 %PKC), followed by 10.0, 20.0 and 30.0% PKC diets.

Weight gain was not affected ($p > 0.05$) across the different PKC diets. This result agrees with the result of Onwudike (1986b) who reported that starter and finisher broilers were able to utilize PKC diets at 28 % and 35 % levels respectively without suffering deleterious effects on production. The result also agrees with the result of Okeudo *et al.* (2005) who observed no significant difference ($p > 0.05$) in weight gain of broilers fed 0.0 % - 30.0% PKC diets from 3rd - 8th weeks of age. Yeong (1980) and Hutagalung (1980) also noted that 20% PKC diets could be offered to broilers without any negative effect on the performance of the birds. Egenuka *et al.* (2013), however, observed progressive increases ($p < 0.05$) in weight gain when 0.0 - 40.0 % PKC were fed to pullets.

Table 2: Performance of starter broilers fed different dietary levels of palm kernel cake.

Parameters	Levels of palm kernel cake (PKC)				
	(0% PKC)	(10% PKC)	(20% PKC)	(30% PKC)	SEM
Av. initial live weight (g)	108.42	114.01	111.24	110.32	2.23
Av. final live weight (g)	884.05	780.79	790.17	785.25	22.92
Av weight gain (g)	775.64	666.78	678.93	674.94	23.81
Weight gain (g/day)	35.25	30.31	30.86	30.68	1.08
Av. feed intake (g/day)	71.39	67.73	68.27	68.56	1.50
Feed conversion ratio	2.03	2.24	2.22	2.24	0.07
Total feed consumption / bird (kg)	1.57	1.49	1.50	1.51	0.04
Cost of feed consumed (N)	154.55^{a}	136.28^{b}	128.35^{bc}	117.7^{c}	3.43
Feed cost/kg gain (N)	199.82	204.69	190.40	174.69	6.47

^{a,b,c} Means within a row with different superscripts are significantly different ($p < 0.05$); Av = Average.

Feed intake of the birds was not significantly different ($p > 0.05$). Okeudo *et al.* (2005) and Egenuka *et al. (*2013) also reported similar feed intake ($p > 0.05$) when finisher broilers and pullets were fed PKC at 0.0 - 30.0 and 0.0 % - 40.0 % levels respectively. There was a significant progressive reduction ($p<0.05$) in the cost of feed consumed with an increase in the level of PKC. This signifies effective feed cost reduction by use of PKC in the diet. Onwudike (1986b) reported a reduced cost of production when PKC replaced groundnut cake in broiler diets. Osei and Amao (1987) also demonstrated a reduction in feed cost by using PKC in broiler feeds.

Conclusion

Starter broilers could be fed 30 % PKC diets resulting in significantly reduced feed cost and no adverse effect on performance.

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