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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

Palm Kernel Cake as Substitute for Maize in Broiler Finisher Diet

M. Anaeto, G.O. Chioma and D.J. Omosebi

Department of Agriculture, Babcock University, Ilisan-Remo, Ogun State, Nigeria

Abstract: A 56 days feeding experiment was conducted using 48 day-old Arbor Acre chicks that were initially raised on a commercial starter for four weeks, to investigate the effect of feeding up to 30% of Palm Cake (PKC) diet on weight gain, organ weight and cost benefit in broiler finisher. On the 29th day, the birds were weighed and randomly grouped into four. Each group had 12 birds per treatment. Four diets were formulated with diet 1 as the control while 2, 3 and 4 had increasing levels of PKC 0, 10, 20 and 30% in the finisher phase. At the end of the experiment, three birds per treatment were slaughtered to compare the internal organs such as the heart, liver, gizzard, spleen and lung. The results showed there was a significant difference ($p < 0.05$) in the average daily gain in broilers fed 20% PKC diet than other treatments. No mortality was recorded during the experiment. Feed cost decreased with increasing levels of PKC in the diets. The feeding of PKC had no significant effect in the internal organ weights except for the gizzard in 20% PKC diet which was significantly heavier ($p < 0.05$) than other treatments. It was concluded that 20% PKC could be incorporated in the broiler finisher diet without compromising their performance.

Key words: Broilers, cost, PKC, weight gain

INTRODUCTION

Broiler production is one of the fastest means of bridging the animal protein gap in the country. Broilers are fast growing meat type birds. When compared to the beef industry, the poultry enjoys a relative advantage of easy management, higher turnover and quick return on investment (Haruna and Hamidu, 2004). Increased cost of feeding is the greatest problem of the poultry farmers (Smith, 1990). Feed cost represent over 66% of the total cost of production (Oluyemi and Roberts, 2000). There are many reports that poultry feeding constitute about 70-80% of the recurrent cost of production. Hence, Kwari *et al.* (2004) stressed the need to utilize alternative feed ingredients far removed from human and industrial interest in order to reduce feed cost and the cost of poultry products. According to Boateng *et al.* (2008) PKC is an agro-industrial by-product that is produced locally and within the West African sub-region in sizeable quantities. This feed resources should be fully utilized to reduce feed cost and also curb the problem of environmental pollution that accompanies its disposal. Nigeria produces large quantities of agricultural and agro industrial by-products which serve as alternative feed sources to conventional feed ingredients and had been proved valuable in supporting the performance of livestock and poultry birds (Babatunde and Oluyemi, 2000). The processing of palm oil from the fruit *Elaeis guineensis* gives rise to Palm Kernel Cake (PKC). According to Sundu *et al.* (2006) palm kernel meal is aflatoxin free, palatable and has considerable potential as carbohydrate and protein source. Yeong *et al.* (1983) reported that PKC is suitable for use in feed formulation for swine, poultry and horses. Hence, this study

investigated the effect of graded levels of PKC diets on broiler performance, internal organs and the cost benefits in the finisher phase.

MATERIALS AND METHODS

The experiment was conducted at the Teaching and Research Farm of Babcock University in Ogun State, Nigeria. Forty-eight Arbor Acre broiler chicks were raised from day old on a commercial starter feed. The recommended medications and vaccines were administered to ensure good health status of the experimental birds. On the 29th day, the birds were weighed and divided into four groups in a completely randomized design. There were three replicates of four birds in each group making a total of 12 birds per treatment. The broiler finisher feed was formulated with PKC to replace maize in the diets at 0, 10, 20 and 30% (Table 1). The energy was within the range for broiler as recommended by (Sainsbury, 2000). Feed and water were supplied *ad libitum* during the experimental period. Three birds from the four dietary treatments were randomly selected, weighed and slaughtered on the last day and the following internal organs - heart, lungs, liver, gizzard and spleen were separated and weighed.

Data collection and analysis: The birds were weighed weekly; feed conversion ratio and mortality were monitored. The internal organs were weighed on a sensitive electronic Adams scale on the 58th day. The cost benefit of feeding PKC was estimated at the end of the study. Data collected was subjected to analysis of variance and the significant differences between treatment means were determined at 5% confidence level (SAS, 1999).

Table 1: Percentage composition of broiler finisher diets (5-8 weeks)

Ingredients	Replacement levels of PKC			
	0% (T1)	10% (T2)	20% (T3)	30% (T4)
Maize	55	49.5	44	38
PKC	0	5.5	11	16.5
Soya beans	16	16	16	16
Ground nut cake	12	12	12	12
Fish meal	2	2	2	2
Wheat offal	11.2	11.2	11.2	11.2
Bone meal	2	2	2	2
Oyster shell	1	1	1	1
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Methionine	0.1	0.1	0.1	0.1
Lysine	0.2	0.2	0.2	0.2
Total	100	100	100	100
Calculated composition				
Crude protein %	20.34	20.00	20.12	20.66
Energy MEKcal/Kg	2815.0	2775.0	2735.0	2694.5

Table 2: Performance of broilers fed PKC diets

Parameters	Replacement levels of PKC			
	T1	T2	T3	T4
Average initial body weight at 28 days(g)	367.83	333.08	378.33	405.83
Average final body weight at 56 days (g)	1316.67 ^b	1288.33 ^b	1428.33 ^a	1395.0 ^a
Total weight gain 28-56 days (g)	948.84 ^b	955 ^b	1050 ^a	989.17 ^a
Average daily gain/bird (g)	33.89 ^b	34.12 ^b	37.5 ^a	35.33 ^b
Feed conversion ratio	2.13	2.15	1.96	2.08
Mortality	0	0	0	0

^{ab}Means within the same row with different superscript are significantly different (p<0.05)

RESULTS AND DISCUSSION

The broilers were fed the experimental diets from the 4th to the 8th week in the finisher phase and the results are presented in Tables 2-4. The initial body weight was between 333 and 405 g. This was rather low and this may be due to the starter feed given to the birds before the commencement of the feeding experiment as a concurrent study comparing three different brands of commercial starter feeds gave a higher body weight of 900g using the same breed. The total weight gain of the broilers on the 56th day was between 0.948-1.005 kg. There was a significant difference (p<0.05) in the weight gain among the birds fed the different diets, with birds fed 20% PKC and 30% PKC diet having a higher weight gain (Table 2). This agrees with Okeudo *et al.* (2005;2006) and Sundu *et al.* (2005) who reported that body weight gain of birds fed 30% palm kernel meal diet increased by 2% over the body weight of birds fed a corn-soy diet but disagrees with Oyediji (2006) who stated that PKC cannot be used in the ration of chicks and broilers. The feed intake and Feed Conversion Ratio (FCR) was not significantly different (p>0.05) among the dietary treatments. Osei and Amo (1987) reported that the addition of PKC to broiler diet had no significant effect on feed consumption up to 8 weeks of age. However, birds on 20% PKC and 30% PKC diet had a slightly better FCR. There was no mortality recorded during the experiment. Soltan (2009) stated that PKC not

Table 3: Weight of internal organs in broiler finisher on the 56th day

Internal Organs	Replacement Levels of PKC			
	T1	T2	T3	T4
Heart	7.81	7.54	6.82	7.86
Liver	30.05 ^b	31.82 ^b	34.86 ^a	34.05 ^a
Gizzard	49.89 ^b	46.84 ^c	53.57 ^a	49.34 ^b
Spleen	1.14	1.35	1.33	1.16
Lung	9.70	7.79	7.66	9.17

^{abc}Means within the same row with different superscript are significantly different (p<0.05)

only increases the birds' productivity and economic efficiency but also improves their health.

The internal organ weight showed that the gizzard of the birds fed 20% PKC diet was significantly different (p<0.05) from other treatments. Similar observation was reported by (Okeudo *et al.*, 2005; Soltan, 2009) The increase in the sizes of the gizzard as the PKC level increases, may be due to the high fiber content Fasina *et al.* (2004). The liver in 20% and 30% PKC was heavier than 10% PKC and the control.

The cost benefit analysis was calculated using the variable cost with some assumptions made in the fixed cost as stated by (Haruna and Hamidu, 2004) for all the treatments during the experimental period. The feed cost per/kg decreased with increasing levels of PKC as shown in Table 4. Furthermore, birds fed 30% PKC diets

Table 4: Cost benefit analysis of broiler finisher fed PKC diets

Item value in Naira (₦)	T1	T2	T3	T4
a) Variable cost				
Cost of day old chick per treatment	2400	2400	2400	2400
Cost of 50 kg feed	3600	3490	3380	3270
Cost of medication/vaccines	325	325	325	325
Total variable cost	6325	6215	6105	5995
b) Fixed cost				
Depreciation on feeder	6	6	6	6
Depreciation on drinkers	6	6	6	6
Depreciation on heating facility	8	8	8	8
Total fixed cost	20	20	20	20
c) Total cost	6345	6235	6125	6015
d) Gross returns	7800	7800	8400	8400
e) Net returns	1455	1565	2275	2385
f) Return on investment	0.23	0.25	0.37	0.40

Naira to US Dollars is 150:1

had the low cost of production and more savings than the birds in other diets. The cost per Kg weight gain was highest in the control and cheaper in the PKC based diets. The Return on Investment (ROI) per naira was between 0.23 and 0.40. This shows that it is more profitable to raise broiler finisher on PKC based diets. The net return and ROI would have been higher but for the high purchase price of the day old chick due to scarcity.

Conclusion: The experiment showed that broiler birds can utilize PKC based diet up to 20% without adverse effects on their production performance. There was a decrease in feed cost and a higher net return on bird fed PKC based diets. Thus, more profit to the poultry farmer. It is therefore, recommended that 20% PKC be included in the ration of broiler finisher birds.

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