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Response of Starter Broiler Chicks Fed Varying Dietary Levels of Palm Kernel Meal

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Abstract
A 28–day feeding trial involving one hundred and twenty one week old Anak broiler chicks was conducted to evaluate the effect of varying dietary levels of palm kernel meal on the performance of broiler starter birds. The broiler chicks divided into 5 groups of 24 birds each. Each group was subdivided into 4 replicates of 6 birds each and the birds were randomly assigned to treatments in a Completely Randomized Design. The birds were weighed at the beginning of the experiment and weekly thereafter. Experimental diets and water were provided *ad-libitum*. The chicks were fed diets containing varying levels of palm kernel meal at 0, 10, 20, 30 and 40.0%. The results of the experiment showed that there were significant differences ($p<0.05$) in average final live weight, average daily feed intake, average daily gain and cost of producing a kilogram weight gain. Non-significant differences ($p>0.05$) were obtained in feed conversion ratio among birds fed the treatment diets. The results of this trial suggest that palm kernel meal could be incorporated in diets of broiler starter birds up to 20% level without any adverse effect on performance of the birds.

Key words: Palm kernel meal, starter broilers, performance

Introduction

The exploitation of under exploited and alternative feeding stuff such as palm kernel meal would not only help to reduce competition for conventional plant protein sources between man and farm animals but reduce the cost of feeding poultry birds due to reduction in the cost of broiler feed. In spite of the dry and gritty nature of palm kernel meal, Olomu (1995) had reported that with proper balancing of diets or careful choice of ingredients combinations or supplementation of diets with deficient amino acids, palm kernel meal could be efficiently utilized at high levels by monogastric animals such as broilers. Palm kernel meal (PKM) contains about 18 - 21% CP, 10 - 20% CF (Olomu, 1995; Amaefule *et al.,* 2006). The first limiting amino acid in PKM is methionine (McDonald *et al*., 1995) while the contents of lysine, histidine and threonine are low (Olomu, 1995).Bello *et al.* (2011) successfully fed broiler chicks up to 30% level of palm kernel meal. Onwudike (1986) while substituting palm kernel meal for groundnut cake in broiler diets recommended 28% for broiler starters and 35% for broiler finishers. Sundu *et al.* (2005) found that body weight of birds fed a balanced 30% PKM diet increased by 2 over the body weight of birds fed a corn–soy diet. A slight reduction in body weight of birds was found when 40% PKM was included but this decrease was not significant.

Materials and Methods

The study was conducted at the Poultry Unit of Michael Okpara College of Agriculture, Umuagwo, Imo state, Nigeria now Imo Polytechnic, Umuagwo, Imo State, Nigeria The Polytechnic lies between latitude 6 °N and longitude 7 °E within the humid Southeastern Nigeria.

One hundred and fifty day old Anak 2000 broiler chicks purchased from Zion Farms, Owerri, Imo state, Nigeria were brooded for one week on deep litter floor. During this period water and palm kernel meal free broiler starter diet were provided *ad-libitum*. One hundred and twenty one–week old chicks were selected and randomly allotted to five treatment diets. The birds were vaccinated routinely during and after brooding. Routine management practices were carried out. The palm kernel meal was cleaned of shells and ground into a meal using motorized electric grinding mill.

At one week of age one hundred and twenty birds were selected and weighed. The broiler chicks were divided into 5 groups of 24 birds each. Each group was subdivided into 4 replicates of 6 birds each and the birds were randomly assigned to treatments in a Completely Randomized Design. The birds were weighed at the beginning of the experiment and weekly thereafter. Experimental diets and water were provided *ad-libitum* while feed intake and mortality were recorded. The chicks were fed diets T_1, T_2, T_3, T_4 and T_5 containing varying levels of palm kernel meal at 0, 10, 20, 30 and 40% respectively (Table 1). Diet T_1 served as control and therefore had 0% inclusion level of palm kernel meal. The composition of the diets is as shown in Table 1. The experiment lasted 21 days.

Table 1: Composition of experimental diets for starter broiler chicks

Ingredients	T_1 (0%)	T_2 (10%)	T_3 (20%)	T_4 (30%)	T_5 (40%)
Maize	45.0	40.0	35.0	27.0	20.0
Groundnut cake	36.0	31.0	26.0	24.0	20.0
Palm kernel meal	0	10.0	20.0	30.0	40.0
Maize offal	10	10	10	10	10
Local fish meal	5	5	5	5	5
Bone meal	3.0	3.0	3.0	3.0	3.0
Common salt	0.30	0.30	0.30	0.30	0.30
Vitamin-mineral premix	0.30	0.30	0.30	0.30	0.30
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20	0.20
Total	100	100	100	100	100
Calculated values					
Crude protein	23.10	23.05	23.03	23.00	23.00
Energy kcal/kg (ME)	2820	2810	2802	2795	2792
Crude fibre	5.52	5.66	5.81	5.95	6.11
Ether extract	3.01	4.14	4.58	5.14	6.20

*Premix contains per kg: Vitamin A (8000IU), Vitamin D_3 (12000 IU), Vitamin E (3 IU), Vitamin K_3-Kastab (2 mg), Vitamin B_2- Riboflavin 8 mg, Vitamin B_3- Nicotinic acid 10 mg, Vitamin B5- Panthothanic acid (150 mg), Copper (Cu) (2mg), Iodine (1.2 mg), Cobalt (0.2 mg), Selenium 0.1 mg.

Data were collected on the initial, final body live weight of the birds, quantity of feed given, the refusal and from where feed intake and body weight gain of the birds were calculated. The market cost of each experimental feed ingredient at the time of the study was used to calculate the cost of feed per kilogram of the diet. Feed cost/kg weight gain was calculated as feed conversion ratios × cost /kg feed. Data obtained were subjected to Analysis of Variance in a Completely Randomized Design. Significant means were separated by Duncan's New Multiple Range Test (SPSS, 1990).

Results and Discussion

The results of the experiment are summarized in Table 2. The birds fed the diets differed significantly ($p<0.05$) in average final live weight. The birds fed diet T_3 containing 20% PKM promoted the highest mean live weight of 1110.76g but was similar ($p>0.05$) to live weights of 1055.84 g and 1049.69 g recorded by birds fed diets T_4 and T_5, containing 30 and 40% PKM, respectively. The live weight of birds fed diets T_1 and T_2 were similar ($p>0.05$) to each other. The increasing live weight of birds as the level of PKM increased in the diets up to 20% and a subsequent decrease in average live weight of the birds as the level of PKM increased to 40% inclusion level could be attributed to nutritional adequacy of the diets. It is probable that at higher levels of PKM, digestibility of nutrients and efficiency of feed utilization of nutrients were impaired (Onifade and Babatunde, 1998; Sundu *et al.,* 2005), resulting in reduced growth and live weight.

The birds fed the treatment diets differed significantly ($p<0.05$) in average daily feed intake, however, birds fed diets T_1 and T_2 consumed comparatively similar quantities of feed daily. The birds ate fairly less quantity of feed on diets containing 0, 10 and 20% levels of PKM than birds fed diets containing 30 (T_3) and 40% (T_4) levels of PKM. The higher feed intake on the diets containing PKM compared to the control diet seems to have manifested in better weight gain up to 20% inclusion level of PKM probably because more nutrients may have been available for growth but declined as the level of PKM inclusion increased. The relatively poorer weight gain of birds fed diets T_4 and T_5 could be as a result of relatively high crude levels of PKM in the diets, the levels of crude fibre in the diets progressively increased. This trend is associated with lower availability of amino acids arising from increased levels of PKM in the diets. This probably contributed to poorer performance of birds fed higher levels (30 and 40%) of PKM. Onwudike (1986) and Sundu *et al.* (2005) had made similar observation. Such effects of crude fibre on growth rate, feed intake and general performance of birds have been reported (Onifade, 1993; Onifade and Babatunde, 1998; Bello, *et al.* (2011). Oluyemi and Roberts (2000) reported that limited fibre can be used by birds and chicks. They are not particularly well equipped to utilize fibre and an excess may cause energy deficiency. Onwudike (1986), Bello *et al. (*2011) and Aimiuwu and Olomu (1997) had observed increased feed consumption with increasing levels of PKM in broiler and pullet chick diets. This is associated with increase in fibre content and reduced caloric content of the diets and the birds responded with increase in feed intake to meet their energy requirement. Onifade (1993), Onifade and Babatunde (1998) and Olorede *et al.* (1997) had made similar observation when broilers were fed PKM based diets.

The feed conversion ratio (FCR) values of birds fed the diets were similar (p>0.05) across treatments. The birds fed diet T_3 with a FCR value of 1.75 were the most efficient converters as they required a relatively smaller quantity of feed to produce a unit weight gain. Bello *et al. (*2011) had obtained similar non-significant differences in FCR of starter broiler chicks. Efficient feed conversion is not a guarantee of profitability if it is obtained by feeding a costly diet (Obua, 2001). The feed cost reduced as the level of PKM in the diets increased. This could be due to the relatively cheaper palm kernel meal which replaced proportions of costlier maize and groundnut cake in the diets. Onwudike (1986) had successfully replaced 60% of groundnut cake with 28% PKM in broiler starter diets. This affected the feed cost of producing a kilogram of meat. Birds fed diet T_5 (40% PKM) recorded the least cost of producing a kilogram of meat (N26.23) which were similar to the values obtained for birds fed diets T_2 (N32.30), T_3 (N28.74) and T_4 (N27.76) but birds fed diet T_1 (control diet) recorded significantly highest value (N35.39).

In this study, it was observed that PKM could be included in the diets of starter broiler chicks up to 20%, replacing 44.0% and 55.5% of maize and groundnut cake, respectively without affecting performance of the birds.

Table 2: Performance of starter broilers fed diets containing varying dietary levels of palm kernel meal

			Diets			
Parameters	T_1 (0%)	T_2 (10%)	T_3 (20.0%)	T_4 (30.0%)	T_5 (40.0%)	SEM
Final weight (g)	934.06^b	954.2^b	1110.76^a	1055.84^a	1049.6^a	35.2
ADG (g)	32.25^c	32.65^{bc}	38.17^a	38.25^a	36.90^a	3.38
ADFI (g)	60.17^{ab}	58.56^{ab}	68.84^a	72.67^a	68.93^a	2.20
FCR	1.85	1.79	1.75	1.89	1.86	0.23
Cost / kg feed(₦)	25.84	24.02	22.20	20.38	19.44	
Feed cost/kg wt gain (₦)	35.39^a	32.30^{ab}	28.74^b	27.76^b	26.23^b	1.82

^{a,bc} means on the same row with different superscripts are significantly different (p<0.05) SEM: Standard Error of Mean: FCR =Feed conversion ratio, ADG =Average daily gain; ADFI = Average daily feed intake (g)

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