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Growth Rate, Carcass Characteristics and Organoleptic Quality of Broiler Fed Graded Levels of Palm Kernel Cake

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Abstract: Four experimental diets containing 0, 10, 20 and 30% palm kernel cake (PKC) were fed to broilers from the 3rd till the 8th week of age. Thereafter, carcass characteristics and organoleptic quality determinations were carried out. The average liveweight of broilers was approximately 2kg in each dietary group at the 8th week of age, and neither final liveweight nor growth rate was significantly affected by dietary treatment ($P > 0.05$). Although dressing percentage and carcass weight were similar across the dietary groups ($P > 0.05$) per cent head and shanks contents were significantly lower in broilers fed the 30% PKC diet ($P < 0.05$). Inclusion of PKC in the diet resulted in significantly increased gizzard size ($P < 0.05$). Meat tenderness and juiciness were not affected by dietary treatment; however, flavour was significantly higher in broilers fed diets containing PKC than in broilers fed the 0% PKC diet ($P < 0.05$). Interestingly, hedonic score for the former was also slightly higher ($P < 0.10$).

Key words: Palm Kernel cake, broiler feeding, ground nut cake

Introduction

In Nigeria, the utilization of palm kernel cake (PKC) in large scale animal feeding is a recent development (Onwudike, 1986a; Umunna *et al*., 1980). The entrenchment of this agro-industrial by-product in poultry feeding was necessitated by the scarcity and rapid increase in the cost of the more conventional protein supplement, groundnut cake (GNC). During the past two decades, the cost of GNC has continued to rise, and this was attributed to declining production and increasing demand by the rapidly expanding human population.

Palm kernel cake is the major by-product in palm oil extraction. The by-product from the mechanical expeller procedure is referred to as palm kernel cake, whilst the by-product from the solvent extraction technique is called palm kernel meal (Choct, 2001). The former may contain four times as much residual oil as the latter (Chin, 2002). Incorporation of PKC in livestock and poultry diets is limited by its high fiber level, gritty nature, unpalatability, relatively low availability levels of amino acids and high copper content (Onwudike 1986b; Hair-Bejo and Alimon, 1995). Howbeit, it has been found that starter and grower pullets can be fed PKC diets at 34% and 38% inclusion levels, respectively, without incurring any significant reduction in growth performance (Onwudike, 1986b). Starter and finisher broiler chicks were able to utilize PKC diets at 28% and 35% levels without suffering deleterious effects on production (Onwudike, 1986c). Jegede *et al*. (1994) fed pigs diets containing PKC at 20.55, 42.10 and 61.65% inclusion levels and reported that beyond the 20.55% level production was significantly decreased. In Malaysia, PKC has been found to be an adequate sole feed (with mineral and vitamin supplementation) for fattening cattle, and the main ingredient in feeding dairy cows (Chin, 2002).

Although numerous investigations have been conducted on the effect of feeding PKC on animal growth and carcass characteristics, it appears the effect on organoleptic quality had been neglected. The object of this study was to determine the effect of feeding graded levels of palm kernel cake on growth rate, carcass characteristics and organoleptic quality of broiler.

Materials and Methods

Management of Birds: A total of 100 one-day-old Anak broiler chicks were brooded till 3 weeks of age following conventional practice. During this period, chicks were fed a proprietary starter ration and offered water *ad libitum*. Afterwards, they were randomized into 4 treatment groups and each group was subdivided into 2 replicates. Treatment 1 replicates contained 13 birds each whilst each of treatments 2, 3 and 4 replicates contained 12. Each treatment group was fed one of four experimental diets containing 0, 10, 20 and 30% PKC levels (Table 1). The PKC used was the by-product from the mechanical expeller process. Growth rate and feed intake were determined weekly, and the trial was terminated at the 8th week of age.

Meat Quality Determination: Twenty-four birds (3 from each replicate) were randomly selected and sacrificed. The weight of the carcass and organs were noted. One drumstick from each carcass was used for cooking loss assessment. Drumsticks were weighed and packaged in polyethylene bags. Samples were boiled in water for

Table 1: Ingredient composition of experimental diets

Ingredients	PKC levels (%)			
	0	10	20	30
Maize	44.00	44.00	41.00	39.00
Palm kernel cake	0.00	10.00	20.00	30.00
Soybean meal	10.00	14.00	16.30	17.05
Brewers dry grain	33.40	20.75	11.20	4.70
Corn offal	4.85	3.50	3.75	1.50
Additional contents[1]	7.75	7.75	7.75	7.75
Calculated chemical composition:				
Crude protein	20.11	20.10	20.20	20.10
ME (MJ Kg^{-1})	11.84	12.95	12.25	11.86

[1]In addition, each diet contained fish meal, 4.00%; bone meal, 3.00%; vitamin / mineral premix, 0.50%; and common salt, 0.25%.

Table 2: Effect of feeding different levels of palm kernel cake (PKC) on feed intake, growth rate and dressing percentage of broilers

Ingredients	PKC levels (%)[1]			
	0	10	20	30
Initial liveweight (kg)	0.48	0.52	0.54	0.46
Final liveweight (kg)	2.02	1.98	2.01	1.89
Average feed intake (g/day)	117.57	127.14	131.43	119.29
Average growth rate (g/day)	44.00	41.71	42.00	40.86
Feed conversion ratio	2.67	3.05	3.13	2.92
Dressing percentage	63.40	71.10	70.60	69.84

[1]Differences were not statistically significant ($P > 0.05$)

30 minutes, wiped dry using paper towel and weighed again. The loss in weight (during cooking) expressed as a percentage of fresh weight was regarded as per cent cooking loss. The second drumstick from each carcass was portioned into two, giving the total of 48 meat samples. All were washed and immersed in a super saturated brine solution (333g L^{-1}) for a few seconds. Thereafter, samples were packaged individually in double layered transparent polyethylene bags, properly tied and labelled and boiled in water for 30 minutes. Organoleptic evaluation was carried out with 24 panelists trained in basic sensory assessment procedures. Each panelist was required to masticate two different samples and score each for tenderness, juiciness, flavour and degree of likeness using the 9 points Category Rating Scale (AMSA, 1978). From each carcass, the muscle anterior to the drumstick was subsampled for intramuscular fat determination, by soxhlet extraction (AOAC, 1990).

Statistical Analysis: Data for each parameter were meaned, and then subjected to analysis for significant differences by the analysis of variance procedure (Snedecor and Cochran, 1967).

Results and discussion

The ingredient composition and the calculated crude protein (CP) and metabolizable energy (ME) concentration are presented in Table 1. The diets were essentially isonitrogenous (20% CP) and similar in energy content (11.84-12.95 MJ kg^{-1}). Across the different dietary groups, growth rate varied between 40.86 g/d and 44.00 g/d, and the final liveweight was approximately 2 kg at 8 weeks of age. However, neither differences in growth rate nor final liveweight were statistically significant ($P > 0.05$). This agrees with earlier reports, confirming that broilers can be finished on diets containing 30% PKC level without any adverse effect on performance (Nwokolo *et al.*, 1977; Onwudike, 1986c). Feed consumption by broilers fed the PKC diets was slightly higher than the control, but statistical significance could not be determined because feeding was done on dietary group basis.

Carcass weight was similar amongst the different dietary groups ($P > 0.05$), as was the case with per cent drumstick content (Table 3). Per cent head and shanks contents were significantly lower in broilers fed the 30% PKC diet than in their counterparts fed the 0, 10 and 20% PKC diets ($P < 0.05$). Okon and Ogunmodede (1996) had earlier reported that broiler chicks reared on 25% PKC diet had smaller heads and intestines than broiler chicks reared on 0% PKC diet. Odunsi *et al.* (2002) reported that shells of eggs produced by layers fed agro-industrial by-products (such as PKC) were thinner than their counterparts from hens fed conventional diets. The authors noted that dietary sources high in non-starch

Table 3: Carcass characteristics and organ proportions[1]

Ingredients	PKC levels (%)				
	0	10	20	30	SEM
Carcass weight (kg)	1.28	1.42	1.37	1.32	0.01
Drumstick (%)	10.07	9.93	9.60	10.12	0.072
Head (%)	3.40[b]	3.00[b]	2.95[b]	2.70[a]	0.089
Heart (%)	0.40[a]	0.40[a]	0.45[b]	0.40[a]	0.008
Shank (%)	4.75[b]	4.75[b]	4.70[b]	4.60[a]	0.022
Wing (%)	4.05	4.25	4.40	4.25	0.044
Gizzard (%)	2.00[a]	2.30[b]	3.10[b]	2.85[b]	0.154

[1]Percentage of liveweight .

[a,b] Means within the same row bearing different superscripts are significantly different (P < 0.05).

Table 4: Cooking loss and organoleptic rating [3]

Ingredients	PKC levels (%)				
	0	10	20	30	SEM
Cooking loss (%)	21.17	21.77	21.65	21.28	0.125
Intramuscular fat (%) [1]	37.07	33.82	38.99	32.91	1.225
Tenderness	7.34	7.67	7.67	7.34	0.083
Juiciness	6.30	7.09	7.24	6.59	0.184
Flavour	5.34[a]	6.50[b]	7.00[b]	7.09[b]	0.349
Hedonic score [2]	6.84	7.33	8.09	7.58	0.023

[a,b] Means in the same row bearing different superscripts are significantly different (P < 0 .05).

[1]Percentage of dry matter.

[2]Significant at 90% level (P < 0. 10)

[3]The 9 points Category Rating Scale was used:

Extremely tender/flavoured/juicy = 9; very tender/flavoured/juicy = 8; moderately tender/flavoured/juicy = 7; slightly tender/flavoured/juicy = 6; neither tender/flavoured/juicy, nor tough/unflavoured/dry = 5; slightly tough/unflavored/dry = 4; moderately tough/unflavoured/dry =3; very tough/unflavoured/dry = 2; extremely tough/unflavoured/dry = 1.

Hedonic scoring: Like extremely = 9; like very much = 8; like moderately =7; like slightly = 6; neither like nor dislike = 5; dislike slightly = 4; dislike moderately = 3; dislike very much = 2; dislike extremely = 1.

polysaccharides probably through the carboxyl groups of the uronic acids can bind divalent cations such as Ca, Fe, Cu, and Zn. Consequently, such diet may require additional supplementation. Reduced calcium absorption would impair skeletal development and probably result in smaller per cent heads and shanks contents as was recorded in this study. Gizzard size was significantly affected by the inclusion of PKC in the diet (P > 0.05). This is in accordance with Onwudike (1986c). Kubena *et al.* (1974) and Deaton *et al.* (1977) demonstrated that gizzard size is positively affected by dietary fiber content. As gizzard is very much relished in Nigeria, this finding is a positive plus for continued utilization of highly fibrous feedstuffs in poultry diets.

The effect of feeding graded levels of PKC on organoleptic quality is presented in Table 4. Tenderness and juiciness were not significantly affected by dietary treatment (P > 0.05). Panelists judged the broilers to be moderately to very tender and slightly to moderately juicy. Interestingly, broilers fed the 0% PKC diet were rated significantly lower in flavour than broilers fed diets containing PKC. Significantly, amongst the birds that consumed PKC diets, flavour was not enhanced by increasing dietary PKC level. Changes in flavour has often been associated with changes in degree of marbling (Lawrie, 1991). In this study, this was not the case. The similarity in ether extract values (an index of degree of marbling) across the dietary groups supports this. The result from hedonic rating suggests that panelists seemed to like meat from broiler fed diets containing PKC more than meat from broiler fed diets that did not contain PKC (Table 4). Operators in the broiler industry may find this observation very interesting.

References

AMSA, 1978. Guidelines for Cookery and Sensory Evaluation of Meat. American Meat Science Association, Chicago Illinois.

AOAC, 1990. Official Methods of Analyses, 15th Edition. Association of Official Analytical Chemists, Washington DC.

Chin, F.Y., 2002. Utilization of palm kernel cake (PKC) as feed in Malaysia. Asian Livestock Vol. XXVI, No. 4. FAO Regional Office, Bangkok Thailand, pp: 19-23.

Choct, M., 2001. Nutritional Constraints to AlternativeIngredients. Technical Bulletin, American Soybean Association, Singapore.

Deaton, J.W., L.F. Kubena, F.N. Reece and B.D. Lott, 1977. Effect of dietary fiber on the performance of laying hens. Br. Poult. Sci., 18: 711-714.

Hair-Bejo, M. and A.R. Alimon, 1995. The protective role of zinc in palm kernel cake (PKC) toxicity in sheep. Mal. J. Nutr., 1: 75-82.

Jegede, J.O., T.S.B. Tegbe, A.O. Aduku and S.A.S. Olorunju, 1994. The effect of feeding palm kernel meal on performance and carcass characteristics of pigs. Nig. J. Anim. Prod., 21: 88-95.

Kubena, L.F., J.W. Deaton, J.D. May and F.N. Reece, 1974. A dietary method to connect a gizzard abnormality of broilers. Poult. Sci., 53: 407-409.

Lawrie, R.A., 1991. Meat Science, 5th Edition. Pergamon Press, Oxford.

Nwokolo, E.N., D.B. Bragg and H.S. Saben, 1977. A nutritive evaluation of palm kernel meal for use in poultry diets. Trop. Sci., 19: 147-154.

Odunsi, A.A., T.O. Akande, A.S. Yusuph and R.I. Salami, 2002. Comparative utilization of high inclusion rates of four agro-industrial by-products in the diets of egg type chickens. Arch. Zootec., 51: 465-468.

Okon, B.I. and B.K. Ogunmodede, 1996. Carcass characteristics of broilers fed periwinkle flesh and palm kernel cake. Nig. J. Anim. Prod., 23: 16-20.

Onwudike, O.C., 1986a. Palm kernel meal as a feed for poultry. 1. Composition of palm kernel meal and availability of its amino acids to chicks. Anim. Feed Sci. Technol., 16: 179-186.

Onwudike, O.C., 1986b. Palm kernel meal as a feed for poultry.2. Diets containing palm kernel meal for starter and grower pullets. Anim. Feed Sci. Technol., 16: 187-194.

Onwudike, O.C., 1986c. Palm kernel meal as a feed for poultry. 3. Replacement of groundnut cake by palm kernel meal in broiler diets. Anim. Feed Sci. Technol., 16: 195-202.

Snedecor, A.W. and W.G. Cochran, 1967. Statistical Methods, 6th Edition. The Iowa University Press, Ames.

Umunna, N.N., A.A. Yusuf and A.A. Aganga, 1980. Evaluation of brewers' dried grains and palm kernel meal as a major source of nitrogen for growing cattle. Trop. Anim. Prod., 5: 239-247.