Volume-2, Issue-8, December-2018: 190-196
International Journal of Recent Innovations in Academic Research ISSN: 2635-3040

Impact of Graded Levels of Palm Kernel Cake (PKC) as Replacement to Soybean on Growth Performance of Broiler Finishers

[1]Udeh, F.U., [1]Onodugo, M.O. and [2]Igugo, R.U.

[1]Department of Animal Science, University of Nigeria, Nsukka.
[2]Enugu State University of Science and Technology, Enugu, Enugu State, Nigeria.
Correspondence E-mail: fredrickudeh11@gmail.com

Abstract: The study was conducted to access the performance of broiler finishers fed graded levels of palm kernel cake (PKC) as replacement to soybean meal. A total of 120 four (4) weeks old commercial broilers of Marshal strain were used for this experiment. The birds were randomly assigned to four dietary treatments containing inclusion levels (T1, 0%), (T2, 5%), (T3, 10%) and (T4, 15%) of palm kernel cake (PKC) and (T1, 16%), (T2, 11%), (T3, 6%) and (T4, 1%) of Soybean meal (SBM) respectively, in a completely randomized design (CRD) experiment. Each treatment was replicated into three with 10 birds per replicate and 30 birds per treatment. The proximate composition of crude protein and metabolizable energy (Kcal/kg) in experimental diets were (T1, 20.12% CP), (T2, 19.27% CP), (T3, 18.2% CP), (T4, 18.27% CP) and (T1, 2742 Kcal/kg), (T2, 2729 Kcal/kg), (T3, 2723 Kcal/kg), (T4, 2720 Kcal/kg) respectively. The result showed final body weight, daily feed intake, average weight gain, feed conversion ratio and cost change per 100kg were significantly ($P<0.05$) affected among treatments whereas, initial body weight, cost per 100kg and percentage mortality were not significantly ($p>0.05$) affected by the dietary treatments. The result indicated that birds in diet II performed better than birds in other dietary treatments. It was therefore concluded that PKC can favourably replace soybean at 5% level of inclusion without adverse effect on the performance of birds and it is thus, recommended that PKC should be used at 5% level of inclusion.

Keywords: Broiler finisher, growth performance, palm kernel cake and soybean meal.

Citation: Udeh, F.U., Onodugo, M.O. and Igugo, R.U. 2018. Impact of Graded Levels of Palm Kernel Cake (PKC) As Replacement to Soybean on Growth Performance of Broiler Finishers. International Journal of Recent Innovations in Academic Research, 2(8): 190-196.

Introduction

The need to produce more animal protein in the country has become increasingly urgent in the view of the ever rising population. Poultry is probably the fastest route to achieve any appreciable improvement in the nutritional standard of the populace because of its short generation interval, quick turnover rate and relatively low capital investment (Ani and Okeke, 2003). Chickens are the most widely distributed of all livestock species in Nigeria with a population of 166 million birds (FAOSTAT, 2007). Chickens play very significant socio-cultural and economic roles in most African societies. Obioha (1992) reported that poultry is a unique farm enterprise, occupying a unique position in the Nigerian livestock production

for several reasons. He also noted that it takes about 7-10 weeks to raise broilers to slaughter weight and it requires about 4-5 kg of feed per bird.

Poultry production has become expensive due to increase in the cost of feed ingredients, as a result of excessive demand for conventional feed ingredients due to increased competition with other livestock species and human beings (Shakila *et al.*, 2012). Poultry as monogastrics consumes similar feed ingredient with man, hence, the increased competition. The major constraints to animal production in many developing countries like Nigeria cannot be unconnected with chronic feed deficit (Salem *et al.*, 2002; Shakila *et al.*, 2012). Consequently, effort should be made to reduce the cost of production (Salem *et al.*, 2002).

The only way out of this menace is to expand the feed resource base through utilization of non-conventional feed resources (NCFRs) or Agro Industrial by-products (AIBPs). Palm Kernel Cake (PKC) is a by-product after extraction of oil from palm fruit (*Elaeis guinensis*). The palm nut is cracked to produce palm kernel which is further crushed and its oil extracted by solvent or expeller method to produce the waste cake (Palm Kernel Cake–PKC) (Kperegbeyi and Ikperite, 2011). Soybean meal and palm kernel cake are very important feedstuffs for farm animals as protein sources and as well as energy-given materials (Chin, 1991; McDonald, 1995). Obioha (1992) reported that soybean meal has crude protein of 47.5% and metabolizable energy of 2.42 kcal/kg. Aduku (1993) reported that soybean has a crude protein level of 44.0% and metabolizable energy of 2.42 kcal/kg, while palm kernel cake has 18.8% CP and 2700 ME kcal/kg. In all, it is obvious that soybean and PKC have a very close value of metabolizable energy but differ widely in their crude protein content. Therefore, this research aimed to investigate the usefulness of unconventional feed ingredients (graded levels of PKC) as replacement to soybean in broiler production.

Materials and Methods

Study Location

The experiment was conducted at the Poultry Unit of the Teaching and Research Farm, Department of Animal Science, University of Nigeria Nsukka. Nsukka is in Enugu state, Nigeria and lies between latitude 06^{o} 52' 24"N, Longitude 07^{o} 39' 23" E and 550 meter elevation above the sea level. Nsukka covered land Area of 17.52 sq mi (45.38 km^{2}) with a population of 309,633 people (Federal Republic of Nigeria Official Gazette, 2007). The climate in this area is humid tropical with average annual rainfall of 1680–1700mm. the mean ambient temperature is 26.6 ^{o}C (Breinholt *et al.*, 1981).

The Experimental animal and design

A total of 120 commercial broiler birds of Marshal strain were used for the experiment. The birds were brooded together in a deep litter system four weeks. Commercial starter feed was provided for the period of brooding and clean water supplied ad libitum. All general flock prophylactic management strategy, routine vaccinations and other health operations were carried out as at when due. No supplemental light was provided during the period of the study. At four weeks of age, the birds were randomly grouped into four and assigned to four finisher dietary treatments containing levels (T1, 0%), (T2, 5%), (T3, 10%) and (T4, 15%) of palm kernel cake (PKC) and (T1, 16%), (T2, 11%), (T3, 6%) and (T4, 1%) of Soybean respectively.

Each treatment was replicated into three with 10 birds per replicate and 30 birds per treatment. For the period of experimentation, quantities of feed supplied and leftover were recorded and body weight measured weekly. The experiment lasted for 8 weeks.

Experimental Diet

The ingredients used were purchased from the Ogige market, Nsukka, processed and compounded at the King-size mills, Onuiyi Nsukka and the Gold Medal mills, Nsukka. The finisher diets were formulated using the recommendations of the National Research Council (NCR) as reported by Obioha (1992).

Table 1. Composition of the experimental diets

Ingredients	T1 = 0%`	T2 = 5%	T3 =10%	T4 =15%
Maize	48.00	48.00	48.00	48.00
Wheat offer	20.00	18.00	15.00	12.00
Soybean Meal	16.00	11.00	6.00	1.00
Palm Kernel Cake	-	5.00	10.00	15.00
Groundnut Nut Cake	8.00	10.00	13.00	15.00
Fish Meal	3.00	3.00	3.00	4.00
Bone Meal	4.00	4.00	4.00	4.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Vitamin Premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Total (kg)	**100**	**100**	**100**	**100**
Crude Protein	20.12	19.27	18.72	18.27
Energy (Kcal/kg ME)	2742	2729	2723	2720

Table 2. Proximate Composition of Experimental Diets

Parameters (%)	T1 (0%)	T2 (5%)	T3 (10%)	T4 (15%)
Crude Protein	20.31	18.91	18.67	18.21
Ether Extract	2.60	2.76	2.50	2.60
Crude Fibre	2.90	3.45	3.15	2.65
NFE	52.34	53.48	55.73	57.11
Ash	12.00	10.50	9.70	10.05
Dry Matter	90.15	89.10	89.75	90.62
Gross energy (Kcal/kg)	2781.60	2786.16	2889.54	2881.52

Parameters Measured

i. The body weight of each broiler was measured on weekly bases using a measuring scale and weighing balance.
ii. Feeds were measured and given to birds on daily bases.

Parameters Calculated

- **Average body weight (g):** The weight of the birds was taken at the 5th week while subsequent weights were weekly.
- **Average daily feed intake (g):** This was determined by the difference between the quantity of feed offered and that left at the previous day and divided by the number of birds in that replicate.
- **Average daily gain (g):** This was obtained by the difference between the final live weight and that of the previous week divided by the number of birds per treatment on daily basis.

- **Feed conversion ratio:** This was determined as the ration of feed intake per bird to that of the weight gain per bird.

Statistical Analysis and Experimental Model

The study was conducted in a completely randomized design (CRD). Data obtained were subjected to analysis of variance (ANOVA) according to the procedures described by Steel and Torrie (1980). Duncan's New Multiple Range Test (Duncan, 1955) was used to separate the treatment means that were significantly different.

Result and Discussion

The result of the proximate composition of crude protein and metabolizable energy in the experimental diets Table 2, was within the standard requirement for broiler finishers as reported by Akinmutimi (2004) and Obioha (1992).

Table 3. The performance of broiler finishers fed graded levels of palm kernel cake (PKC)

	Diets/Treatments					
Parameters	**T1 (0%)**	**T2 (5%)**	**T3 (10%)**	**T4 (15%)**	**SEM**	**Sig.**
Initial body weight (g)	630.0	570.00	540.00	560.00	1.00	NS
Final body weight (g)	1950.00^{b}	2030.00^{a}	1920.00^{ab}	1810.00^{c}	1.09	*
Daily Feed intake (g)	216.54^{b}	220.42^{a}	204.67^{ab}	198.78^{c}	3.37	*
Daily Weight gain (g)	45.52^{bc}	50.27^{a}	47.70^{b}	43.10^{c}	0.96	*
Feed conversion ratio	4.76^{a}	4.28^{d}	4.30^{c}	4.61^{b}	0.07	*
Cost per 100kg feed (₦)	8535.00	8085.00	7785.00	7635.00	0.00	NS
Cost per 1kg feed (₦)	85.35	80.85^{a}	77.85^{b}	900.00^{c}	0.01	*
% Mortality	0.00	0.00	0.00	0.00	0.00	NS

a,b,c, superscripts on means within a row indicate significant differences (P<0.05), * = p<0.05, ** = p<0.01.

The performance of broiler finisher fed graded levels of palm kernel cake (PKC) is presented in Table 3. The result showed that final body weight, daily feed intake, average weight gain, feed conversion ratio and cost per 1kg feed were significantly ($p<0.05$) affected by the dietary treatments, whereas, initial body weight, cost per 100kg feed and percentage mortality indicated no significant ($p>0.05$) difference among the dietary treatments. Final body weight was significantly ($p<0.05$) increased in the dietary treatments, with T2 (5% PKC) recording the highest value 2030.00g and lowest value of FCR among other treatments, whereas T4 (15% PKC) had the least value 1810.00g. Compared to the initial body weight, there were substantial increases in body weight across the treatments as the age increased with T2, T3 and T4 recording final body weight of 2030.00g, 1920.00g and 1810.00g at 8 week of age. This progressive increase in body weight with age was in agreement with the findings of Adeniji and Ayorinde (1990) who reported that body weight increases with age in broiler finishers. The final body weight values obtained at 8 weeks of age in this study agreed with the report of Akanno *et al.,* (2007), who stated that broiler birds attain a market weight of 1300g–2000g at 8–10 weeks of age and Abdulla *et al.,* (2010), who reported an average weight of 1801.00g for Ross broilers at 7 week of age. However, Campbell *et al.,* (2003) opined that broiler birds are fed to attain live weight of 1.82kg and marketed as early as 6 to 7 weeks of age. The final live weights of the birds in all the dietary treatments were within the ranges established by Obioha (1992) and Oluyemi and Roberts (2000) for broiler finisher

chickens. The increased final body weight recorded in T2 may be attributed to the increased feed intake because animal feed to satisfy their nutritional requirements.

Daily feed intake was significantly ($p<0.05$) influenced by the treatments and decreased in quantity consumed as dietary level of inclusion of PKC increased. The quantity of feed consumed varied from 198.78g–220.42g with T4 (15% PKC) recording the lowest value (198.78g) and T2 (5% PKC) the highest value (220.42g). This was in line with the findings of Akinmutimi (2001) who reported decrease in feed intake with increase in higher inclusion of dietary potash cooked lima bean. The decreased daily feed intake may be attributed to higher fat content of PKC because palm kernel cake is a high energy diet (Aletor and Fasuyi, 1997). Higher fat content of feed means higher energy content, and as a result, the birds fed little to satisfy their energy requirements.

Average daily weight gain was affected significantly ($p<0.05$) by the diets and values ranged from 43.10g to 50.27g with T2 having the highest value and T4 the least value. The least value obtained in T4 (15% PKC) was a reflection of the lower body weight recorded in that treatment, and this may be attributed to the reduction in crude protein content of the diet. This result is lower than the ranges of 780.00–1163.00g reported by Machebe *et al.,* (2011) in chickens fed *Gongronema latifolia* leaf extract and 358.52–381.03g reported by Faruque *et al.,* (2013). The higher values reported by these authors could be attributed to the methods used to process the ingredients and their crude protein and energy content of the diets. However, the average daily weight gain agreed with Ironkwe and Ukanwoko (2012) who reported daily weight gain ranges of (47.86 to 59.49g) in broilers fed composite cassava meal and Ndelekwute *et al.,* (2014) who also reported values (45.36 to 52.14g) in broilers fed acetic-acid treated diets. The average daily weight gain obtained in this study may be attributed to high energy content of PKC which may have led to deposition of fat in the tissue and consequent increase in weight.

Feed conversion ratio varied significantly ($p<0.05$) across the diets with T2 (5% PKC) recording the lowest value (4.28) and highest value (4.61) was recorded in T4 (15% PKC). The values of feed conversion ratio obtained in this study across the treatments were higher than the values reported by Nworgu *et al.,* (2007), however, it agreed with (4.10) reported by Machebe *et al.,* (2011), and within the ranges of (3.60 to 4.66) reported by Esonu *et al.,* (2006). Low rate of feed conversion to meat may be attributed to lower nutrient composition and high fibre contained in PKC. Cost per 1kg feed varied significantly ($p<0.05$) across the diets with T2 recording the least cost, while T4 recorded the highest cost.

Conclusion and Recommendation

In conclusion, this study showed that birds fed diet T2 (5% PKC) had the best growth performance than those in other treatments and the diet also had the least cost and FCR. It is therefore, recommended that soybean should be replaced with PKC at 5% level of inclusion for maximum performance of the broiler finishers and with minimum cost.

References

1. Abdullah, Y.A., Al-Beitawi, N.A., Rjoup, M.M.S., Qudsieh, R.I. and Ishmais, M.A.A. 2010. Growth performance, carcass and meat quality characteristics of different commercial crosses of broiler strains of chickens. Journal of Poultry Science, 47: 13-21.

2. Adeniji, F.O. and Ayorinde, K.L. 1990. Predicting body weight of broiler at different ages from some linear body measurements. Nigerian Journal of Animal Production, 17: 42–47.

3. Aduku, A.O. 1993. Tropical Feedstuff Analysis Table. Department of Animal Science, Ahmadu Bello University, Samaru, Nigeria, 4 p.

4. Akanno, E.C., Ole, P.K., Okoli, I.C. and Ogundu, U.E. 2007. Performance characteristics and prediction of body weight of broiler strains using linear body measurements. Proceedings 22nd Annual conference of the Nigerian Society for Animal Production, Calabar, 162-164 pp.

5. Akinmutimi, A.H. 2001. The effect of potash cooked lima bean (*Phaseolus lunatus*) on broiler starter diets: Nigerian Agriculture Journal, 32: 109-118.

6. Akinmutimi, A.H. 2004. Evaluation of Sword bean (*Canavalia gladiata*) as an alternative feed resource for broiler chickens. Ph.D. Dissertation, Michael Okpara University of Agriculture, Umudike, Abia State, 28-33 pp.

7. Aletor, V.A. and Fasuyi, A.O. 1997. Nutrient composition and processing effects on cassava anti-nutrients. ASAN Lagos: Sept, 15-17, 131 -242 pp.

8. Ani, A.O. and Okeke, G.C. 2003. The substitution of pigeon pea (Cajanuscajan) seed meal for soyabean in broiler finisher ration. Proceedings 8th Annual Conference of ASAN, 10-12 pp.

9. Breinholt, K.A.L., Gowen, F.A. and Nwosu, C.C. 1981. Influence of environmental and animal factors on day and night grazing activity of imported Holstein-Friesian cow in the humid lowland tropics of Nigeria. Tropical Animal Production, 6(4): 300–307.

10. Campbell, J., Quigley, J., Russell, L. and Kidd, M. 2003. Effect of spray-dried bovine serum on intake, health, and growth of broilers housed in different environments. Journal of Animal Science, 81: 2776–2782.

11. Chin, F.Y. 1991. Palm Kernel Cake (PKC) as a supplement for fattening and dairy cattle. Malaysia: Department of Vet.Serv. 8th floor, Wisma Chasc Perdana Jaian Semantan, Bukit Damansava, 50630 Kuala Lumpua, 25-26 pp.

12. Duncan, D.B. 1955. Multiple Ranges and Multiple F. test Biometrics. New York, McGraw Hill Higher Education.

13. Esonu, B.O., Ogbonna, U.D., Anyanwu, G.A., Emenalom, O.O., Uchegbu, M.C., Etuk, E.B. and Udedibie, A.B.I. 2006. Evaluation of Performance, Organ Characteristics and Economic Analysis of Broiler Finisher Fed Dried Rumen Digesta. International Journal of Poultry Science, 5(12): 1116-1118.

14. FAOSTAT, 2007. Food and Agricultural Organization statistical databases. CDROM.

15. Faruque, S., Islam, M.S., Afroz, M.A. and Rahman, M.M. 2013. Evaluation of the performance of native chicken and estimation of heritability for body weight. Journal of Bangladesh Academy of Sciences, 37(1): 93–101.

16. Federal Republic of Nigeria Official Gazette. 2007. Legal notice on publication of the detail of the breakdown of the National and State Provisional Totals 2006 Census. Retrieved 2010-07-01.

17. Ironkwe, M.O. and Ukanwoko, A.I. 2012. Growth Performance of Broiler Finisher Birds Fed Composite Cassava Meal (CCM). Bulletin of Environment Pharmacology and Life Sciences, 1(6): 30–34.

18. Kperegbeyi, J.I. and Ikperite, S.E. 2011. The effectiveness of replacing maze with palm kernel cake in broilers' starter diets. Journal of Environmental Issues and Agriculture in Developing Countries, 3(1): 145.

19. Machebe, N., Agbo, C. and Onuaguluchi, C. 2011. Performance of chickens fed *Gonronema latifolia* leaf extracts as a supplementary source of vitamins and minerals. Livestock Research for Rural Development, 23(4): 2011.

20. McDonald, P., Edwards, R.A. and Greenhalgh, J.F.D. 1995. Animal Nutrition. Singapore: Educational Low-priced Books Scheme, 1-15 pp.

21. Ndelekwute, E.K., Okonkwo, A.C., Umoh, B.I. and Nwokoro, C. 2014. Growth performance and economic returns of broiler chickens fed with acetic acid-treated diets at finisher phase. Nigerian Journal of Agriculture, Food and Environment, 10(1): 8-12.

22. Nworgu, F.C., Ogungbenro, S.A. and Solesi, K.S. 2007. Performance and some blood chemistry indices of broiler chicken served Fluted Pumpkin (*Telferia occidentalis*) leaves extract supplement. American-Eurasian Journal of Agriculture and Environmental Sciences, 2(1): 90-98.

23. Obioha, F.C. 1992. A Guide to Poultry Production in the tropics. Enugu: ACENA Publishers Ltd, 15-95 pp.

24. Oluyemi, J. A. and Roberts, F.A. 2000. Poultry Production in Warm Climate. Spectrum Books Limited. 2nd Revised Edition, 140-153 pp.

25. Salem, H.B., Makker, H.P.S. and Nefzaoui, A. 2003. Towards Better Utilization of Non-Conventional Feed sources by sheep and Goals in some African and Asian Countries. Austria: Animal Production and Health section, Joint FAO/IAEA Division, 177-187 pp.

26. Shakila, S., Sudhakara, P., Reddy, P.V.V., Ramana, J.V. and Ravi, A. 2012. Effect of Palm Kernel Meal on the Performance of Broilers. Tamil Nadu Journal of Veterinary and Animal Sciences, 8(4): 227-234.

27. Steel, R.G.D. and Torrie, J.H. 1980. Principles and procedures of Statistics: A biometric Approach New York: McGraw Hill Higher Education. The Cambridge International Dictionary of English 2003 edition, 115-118 pp.