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Comparative Performance and Haematological Indices of Finishing Broilers Fed Palm Kernel Cake, Bambara Offal and Rice Husk as Partial Replacement for Maize

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Abstract: Ninety six unsexed four weeks old Anak broilers were used to compare the performance of finishing broilers fed Palm kernel cake, Bambara offal and Rice husk as partial replacement for maize. The ninety-six broilers were divided into four groups and fed diets containing either 40 percent Maize (T1) as control or 20 percent Palm kernel cake (T2), 20 percent Bambara offal (T3) and 20 percent Rice husk (T4). Each group was replicated thrice with 8 birds per replicate in a Completely Randomized Design (CRD). Feed and water were provided *ad libitum* for the 28 days the trial lasted. Results showed that the effect of treatments on final body weight, body weight gain, feed intake, feed conversion ratio and feed cost/kg gain were significant ($P < 0.05$). Average daily gain of 0.075kg observed in birds on T2 was significantly different ($P < 0.05$) from values of 0.065kg, 0.066kg and 0.067kg recorded for birds on the control, T3 and T4 diets respectively. Also, the same group (T2) had superior feed cost per kg gain of ₦118.60 which differed significantly ($P < 0.05$) from ₦135.59 and ₦154.40 observed for birds on the control and T4 diets respectively. Haematological investigation revealed that the same birds on T2 had significantly higher values ($P < 0.05$) of red blood cell, haemoglobin, packed cell volume and eosinophils. Results of this study showed that 20 percent PKC can effectively replace maize in diets of finishing broilers with better performance and economic returns.

Key words: Anak broilers, palm kernel cake, bambara offal, rice husk, maize

Introduction

It is well settled that there is inadequate intake of animal protein in Nigeria (Atsu, 2002; Ajayi *et al.*, 2007). Poultry production has emerged as having an unquestionable propensity to close the existing gap in animal protein consumption in the country. This according to Ibe (2004) is because of their short gestation and generation interval, large number, fast growth, greater afford ability, ease of raising, absence of taboos to production and consumption and absence of barriers to production in any climatic zone in the country. Haruna and Hamidu (2004) further stated that poultry enjoys a relative advantage over other livestock in terms of its easy management, high turnover, quick return to capital investment and wide acceptance of its product for human consumption. The poultry industry in Nigeria is expanding rapidly and broiler production is an important aspect of the industry. The main factor militating against this rapid expansion of the industry is the problem of inadequate supplies of feed stuff at economic prices. Feed cost is perhaps the most expensive input in poultry production as it constitutes about 70-80 percent of the real cost of production for intensively reared stocks (Omeje *et al.*, 1999; Ijaiya *et al.*, 2004). Onyimonyi and Onukwufor (2003) had earlier observed that a major solution to the problem of rising costs and scarcity of energy and protein sources for monogastrics is seeking new and non-conventional feed resources which are able to replace certain proportions of maize in broiler

rations without any deleterious effect on performance. The feeding value of such non - conventional feed resources as Palm kernel cake, Bambara offal and Rice husk are well documented (Fetuga *et al.*, 1977; Fetuga and Tewe, 1975; Iyayi *et al.*, 2005; Onyimonyi and Ugwu, 2007). These non - conventional feeding stuffs can be commonly found in the Southeastern states of Nigeria. Based on recommended literature values for utilization of these aforementioned feed stuffs, the present study was designed to compare the performance of finishing broilers fed Palm kernel cake, Bambara offal and Rice Husk as partial replacement for maize in the control diet.

Materials and Methods

Ninety six unsexed 4 weeks old finishing broilers of Anak strain were randomly assigned to four treatments of twenty four birds each. Each treatment was further replicated thrice with eight birds per replicate in a Completely Randomized Design (CRD). The control treatment (T1) had 40 percent maize whereas in treatments 2, 3 and 4 half of the maize in the control (20 percent) diet were replaced with Palm kernel cake, Bambara offal and Rice husk respectively (Table 1). Each diet was offered *ad libitum* to the birds for twenty eight days. Water was also provided *ad libitum*. Standard management procedures typical of finishing broiler in a tropical environment were strictly applied. Feed intake for each replicate was recorded on a daily

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Table 1: Percentage composition of experimental diets

Ingredients	Treatments			
	T1	T2	T3	T4
Maize	40	20	20	10
Wheat offal	16	16	16	16
Palm Kernel cake	-	20	-	-
Bambara offal	-	-	20	-
Rice Husk	-	-	-	20
Soya bean Meal	23	19	19	23
Ground nut cake	12	12	12	12
Fish Meal	4	4	4	4
Bone meal	2.5	2.5	2.5	2.5
Limestone	1.5	1.5	1.5	1.5
Methionine	0.25	0.25	0.25	0.25
Premix*	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated				
Crude Protein (%)	21.30	21.24	21.24	21.3
Crude fibre (%)	5.0	7.2	7.8	7.2
Energy (MJ/Kg)	11.75	12.5	12.75	12.44
Cost/ tonne (₦)	50,810	45,410	45,810	44,616
Cost Differential	-	5,200	30000	5,000

* Supplied per kg of diet: 5,000iu vit A; 1,000,000iu vitD₃; 800mg vit E, 400mg vit K; 1,200mg vit B₂; 1,000mg vit B₆; 4mg vit B₁₂; 3,000mg Niacin; 4,000mg vit. C; 11200mg chlorine; 24000mg Mn; 8,000mg Fe; 1,600mg Cu; 18,000mg Zn; 500mg Iodine; 48mg selenium; Antioxidant (BHT).

basis. Weekly body weight measurements of each bird in a replicate were kept. Feed conversion ratio was estimated as ratio of Feed/Gain. Feed cost/kg of body weight gain was determined by multiplying the cost per kg of feed by the corresponding Feed Conversion Ratio. On the 28th day of the feeding trial, three birds per treatment were randomly picked and bled by humane puncture of the wing vein and blood collected separately into bottles containing Ethylenediaminetetraacetic acid (EDTA) for hematological investigations. Packed Cell Volume (PCV) and haemoglobin concentration were determined using Wintrobe's Microhaematocrit and cyanomethaemoglobin methods respectively. White Blood cells (WBC) and Red Blood cells (RBC) counts were estimated by using improved Neubauer haemocytometer as outlined by Davie and Lewis (1975). Feed samples were assayed for proximate composition by the method of Official Analytical Chemist (AOAC, 1990). Gross energy of feed was determined using adiabatic oxygen Bomb calorimeter technique (Table 2). Data collected were subjected to analysis of variance (ANOVA) in a Completely Randomized Design as outlined by Steel and Torrie (1960) using a Stastgrahic computer package. Significantly different means were separated using Duncan's New Multiple Range Test (Duncan, 1955) in the same package.

Results and Discussion

The performances of the birds under the various treatments are presented in Table 2. Results show that the effect of treatments on final body weight, body weight gain, feed intake, feed conversion ratio, feed cost/kg gain

Table 2: Proximate composition of experimental diets

Composition	Diets 1	Diet 2	Diet 3	Diet 4
Dry matter (%)	85.40	88.50	88.20	89.35
Crude protein (%)	22.30	21.94	22.18	21.76
Crude fibre (%)	6.2	8.3	8.8	9.0
Ether Extract (%)	5.0	10.0	5.0	5.0
Ash (%)	10.0	10.0	10.0	15.0
Nitrogen free Extract (%)	41.90	38.26	42.22	38.59
Gross Energy (MJ/kg)	15.74	16.55	16.85	16.44

were significant ($P < 0.05$). Birds on the 20 percent palm kernel cake (Treatment 2) had the highest final body weight of 3.18kg. This value differed significantly ($P < 0.05$) from the values of 2.97kg and 2.88kg recorded respectively for birds on the control (Treatment 1) and 20 percent Rice husk diet (Treatment 4). It however did not differ from the value of 3.00kg observed for birds fed 20 percent Bambara offal (Treatment 3). The trend of body weight gain was the same as observed in final body weight with birds on the 20 percent PKC diet (Treatment 2) having the best value of 0.075kg. This value differed significantly from 0.065kg, 0.066kg and 0.067kg recorded for birds on the control, 20 percent bambara offal and 20% Rice husk diets respectively. Treatment effects on daily feed intake showed that birds on Treatment 2 and Treatment 4 recorded 0.193kg and 0.234kg respectively and showed no significant ($P > 0.05$) difference. These values however, were highly significant ($P < 0.05$) different from Treatment 1 and Treatment 3 with 0.174kg respectively. Also effects of treatments on Feed Conversion Ratio indicated that birds on the 20 percent Rice husk diet (Treatment 4) had significantly ($P < 0.05$) worst values. Their feed conversion ratio was 3.46 and differed significantly from values of 2.67, 2.61 and 2.61 observed for birds on the control, Treatment 2 and Treatment 3 diets respectively. On feed cost/kg body weight gain, results showed that significant difference ($P < 0.05$) existed between the treatments. It showed that feed cost/kg body weight gain decreased significantly ($P < 0.05$) in Treatment 2 (₦118.60) being the lowest while highest value was recorded for birds on treatment 4 (₦154.40). Results of haematological characteristics of the birds are presented in Table 3. The effect of treatments on red blood cell, haemoglobin, packed cell volume, eosinophils and Lymphocytes were significant ($P < 0.05$). The effect of treatments on red blood cell revealed that birds on PKC diet (Treatment 2) recorded the highest value of 6.85 and this differed significantly ($P < 0.05$) from values 6.51 and 6.57 recorded for birds on Treatment 3 and 4 respectively. Similar trend of superior values of the birds on the 20 percent palm kernel cake diet was recorded in haemoglobin results. Birds on this diet had a value of 7.14g/dl which differed significantly from value of 6.17g/dl recorded for birds on the 20 percent Bambara offal diet (Treatment 3). The values obtained for birds on control diet (6.63g/dl) and those on Rice husk (6.58g/dl) were statistically the same ($P > 0.05$). The effects of

Table 3: Performance of finishing broilers fed palm kernel cake, bambara offal and rice husk as partial replacement for maize

Parameters	Dietary Treatments				SEM
	1(control)	2	3	4	
Initial Body weight (kg/bird)	1.15	1.11	1.15	1.10	0.02
Final Body Weight (kg/bird)	2.97 ^a	3.18 ^a	3.00 ^{ab}	2.88 ^b	0.06
Av.Daily weight Gain (kg/bird)	0.065 ^b	0.075 ^a	0.066 ^b	0.067 ^b	0.06
Av.Daily feed Intake (kg/bird)	0.174 ^b	0.193 ^a	0.174 ^b	0.234 ^a	0.17
Feed conversion Ratio	2.67 ^b	2.61 ^b	2.61 ^b	3.46 ^a	0.67
Feed cost/kg gain (₦)	135.59 ^b	118.60 ^c	119.41 ^c	154.40 ^a	3.19

^{abc}Row means with different superscripts are significantly different at 5% (P<0.05). SEM = Standard error of mean

Table 4: Haematological characteristics of finishing broilers fed palm kernel cake, bambara offal and rice husk as partial replacement for maize

Parameters	Dietary Treatments				SEM
	T1(Control)	T2	T3	T4	
Red blood cell (X10 ⁶)	6.61 ^{ab}	6.85 ^a	651.0 ^b	6576.0	0.10
Haemoglobin (g/dl)	6.63 ^{ab}	7.14 ^a	6.17 ^b	6.58 ^{ab}	0.21
Packed cell volume (%)	34.89 ^b	36.44 ^a	30.33 ^c	30.22 ^c	0.57
Eosinophil (%)	4.56 ^b	5.78 ^a	3.67 ^b	4.33 ^b	0.46
White Blood cell (X10 ⁶)	11.50	13.81	12.43	11.81	1.09
Neutrophils (%)	26.44	31.33	28.44	27.57	2.16
Lymphocytes (%)	69.33 ^{ab}	64.89 ^b	70.33 ^a	67.67 ^{ab}	1.88

^{abc}Row means with different superscripts are significantly different at 5% (P<0.05) SEM = Standard Error mean.

treatments on packed cell volume indicated significant difference among the treatments (P<0.05). The highest value 36.44 percent was recorded for birds on 20 percent palm kernel cake diet (Treatment 2) while the lowest value (30.22 percent) was recorded for birds on 20 percent Rice offal diet. Results further showed that birds on the 20 percent palm kernel cake (Treatment 2) recorded the highest eosinophil value of 5.78% which differed significantly from the value 3.67 percent record for birds on 20percent Bambara offal. The effect of treatment on Lymphocytes however deviated from the trend and showed that birds on 20 percent bambara offal recorded the highest values of 70.33 percent while the lowest value of 64.89 percent was recorded for birds on 20percent palm kernel cake diet.

Results indicated that birds on the 20 percent PKC diet (Treatment 2) showed superior performance in all the parameters measured. Feeding finishing broilers on 20 percent PKC diet as partial replacement for maize poses no detrimental consequence on performance of the bird. PKC is a cheap protein and energy concentrate containing about 21.3% crude protein, 2170kcal/kg ME and 10.40% crude fibre. It is extremely rich in arginine, fairly rich in methionine plus cystine Fetuga *et al.*, 1997. Abonyi and Uchendu (2005) had earlier observed that finishing broilers fed 20 percent level of PKC had significantly final body weight and dressing percentage than their counterparts.

Ojewola and Ozuo (2006) had earlier reported that growing cockerels fed 5 percent palm kernel meal as partial replacement for soyabean meal had better performance indices than control birds. The present work agrees with these results.

The present finding however do not agree with the report

of Ezieshi and Olomu, 2004 who observed decreased weight gain when PKC was used to replace up to 30 or 43. 75 percent of the maize fraction of the control diet. The observed difference may be attributed to the higher levels of PKC in their work. The significantly higher feed intake values observed for birds on the PKC and Rice husk diet could be traced to their high fibre content. There is evidence in the literature that dietary fibre causes a dilution of the energy content of the ration and the birds in an attempt to meet or satisfy their energy requirements will increase their feed intake (Onifade, 1993). Also, the extent to which an animal will consume a particular feed is dependent on the fiber source (Linderman *et al.*, 1986), palatability of the diet (Chery and Jones, 1982), its composition of the feed and chemical variation in fibre itself (Kass *et al.*, 1970). Pond *et al.* (1988) had earlier reported that cereal fibre is only slightly modified during gut transition unlike vegetable fibre in which microbial digestion would probably result in total destruction of fibre cell matrix. High dietary fibre depresses apparent digestibility of dry matter and nitrogen, decreases daily body weight and increase feed to gain ratio. The depressing effect on apparent digestibility has been found to be due to greater rate of passage (Longe and Adekoya, 1988). It is our opinion that these factors acting singly or in combination promoted the performance of the birds on 20 percent PKC diet. The poor performance of birds on 20 percent Rice husk diet can be attributed to the bulk of the fibre and silica in rice husk. The feeding value of rice husk as obtained in raw state from rice mills in Nigeria could only be enhanced by percentage of broken grains and bran present in it.

The observed superiority of haematological parameters

of birds on the 20 percent PKC diet is not surprising. There is evidence in literature that haematological characterizes of livestock suggest their physiological disposition to the plane of nutrition (Madubike and Ekenyem, 2006). Reduction in packed cell volume and Red blood cell values are indicative of low protein intake or mild anaemia (Lindsay, 1977). Haematological indices are positively correlated with the nutritional status of the subject. Animals on a high plane of nutrition tend to show better haematological indices than their counterparts on a low plane of nutrition. The results observed for the red blood cell counts, haemoglobin and packed cell volume were within normal ranges of 2.5-3.2 millions per mm³, 6.5-9g/dl and 30-33 percent reported respectively for these parameters by Sveenson and Reece, 1993. This further suggests the fact that the different diets were balanced in their formulation to support optimum performance and haematological profiles of the birds.

Conclusion: From the results of this study it is concluded that replacing 20 percent maize with palm kernel cake enhanced better performance of finishing broilers.

References

- A.O.A.C., 1990. Association of Official Analytical Chemists. Official Methods of Analysis, Washington, D.C.
- Abonyi, F.P. and C.N. Uchendu, 2005. Effect of graded levels of palm kernel cake finisher diet on broiler performance. Proceedings of 30th Annu. Conf. Nig. Soc. Anim. Prod. (NSAP), pp: 204-206.
- Ajayi, A.F., G.O. Farimu, O.O. Ojebiyi and T.B. Olayemi, 2007. Performance Evaluation of male weaner rabbits fed diets containing graded levels of blood-wild sunflower leaf meal mixture. World J. Agric. Sci., 3: 250-255.
- Atsu, D.W., 2002. Contributory role of animal production in national development. Keynote address delivered at the opening ceremony of the 7th Annu. Conf. Anim. Sci. Assoc. Nig. (ASAN), pp: 16-18.
- Chery, J.A. and L.E. Jones, 1982. Dietary cellulose, wheat bran and fish meal in relation to hepatic lipids, serum lipids and lipid exertion in laying hens. Poult. Sci., 61: 1873-1878.
- Davie, J.V. and S.M. Lewis, (1975). Practical Haematology. Churchill Livingstone, Edinburgh.
- Duncan, D.B., 1955. New Multiple Range Test. Biometrics, 11: 1-42.
- Ezieshi, E.V. and J.M. Olomu, 2004. Comparative performance of broiler chicken fed varying levels of Palm kernel cake and Maize offal. Pak. J. Nutr., 3: 254-257.
- Fetuga, B.L. and O.O. Tewe, 1975. Potentials of agro industrial by products and crop residues as livestock feed components. Nig. Food J., 2:136-142.
- Fetuga, B.L., G.M. Babatunde and V.A. Oyenuga, 1977. The value of palm kernel meal in finishing diets for pigs. The addition of cane molasses on the utilization of diets. J. Agric. Sci., 88: 665-669.
- Haruna, U. and B.M. Hamidu, 2004. Economic Analysis of Turkey production in the western Agricultural zone of Bauchi State. Proceedings of the 9th Annu. Conf. Anim. Sci. Assoc. Nig. (ASAN).
- Ibe, S.N., 2004. The role of Genetics and livestock Breeding in Nigeria Animal protein self sufficiency. A case of day old chicks. Proceedings of the 9th Annu. Conf. Anim. Sci. Assoc. Nig. (ASAN).
- Ijaiya, A.T., O.O.A. Fasanya and B.A. Ayanwale, 2004. Reproductive performance of breeding rabbit does fed maize and ferment cassava peel meal. Proceedings of the 29th Annu. Conf. Nig. Soc. Anim. Prod. (NSAP).
- Iyayi, E.A., O. Ogunsola and R. Ijaya, 2005. Effect of three sources of fibre and period of feeding on the performance, carcass measure; organs relative weight and meat quality in broilers. Int. J. Poult. Sci., 4: 695-700.
- Kass, M.L., P.J. Van Soest and W.G. Pond, 1970. Utilization of dietary fibre from alfalfa by growing swine. Apparent digestibility of diet component in specific segments of the gastro intestinal tract. J. Anim. Sci., 50: 125-191.
- Linderman, M.D., E.T. Kormegay and R.J. Moore, 1986. Digestibility and feeding values of peanut hulls for swine. J. Anim. Sci., 62: 412-421.
- Lindsay, D.B., 1977. The Effect of feeding patterns and sampling on blood Parameters. Occasional publication Lister (Ed.). No.1.Br. Soc. Anim. Prod., pp: 99-120.
- Longe, O.G. and O.F. Adekoya, 1988. Response of Laying hens to different inclusion level of Palm Kernel Meal and Vegetable. Nig. J. Anim. Prod., 15: 111-117.
- Madubike, F.N. and B.U. Ekenyem, 2006. Haematology and Serum Biochemistry Characteristics of Broiler Chicks fed varying Dietary Levels of *Ipomoea Asarifolia* leaf meal. Int. J. Poult. Sci., 5: 9-12.
- Ojewola, G.S. and U.K. Ozuo, 2006. Evaluation of Palm Kernel Meal as Substitute for Soyabean Meal in the Diets of Growing Cockerels. Int. J. Poult. Sci., 5: 401-403.
- Omeje, S.T., F.U.C. Marere and J.O. Isikwnu, 1999. Comparative affect of usual commercial feeds and cassava based formulation on the performance of Harco and Yaafa cockerels. Proceedings of the 26th Animal conference of the Nigeria Society for Animal Production (NSAP).
- Onifade, B.I, 1993. Influence of density and Feeding interval on Performance and Behaviour of broiler Chickens under high temperature. Poult. Sci. J., 72: 1043-1047.

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- Onyimonyi, A.E. and J.O. Onukwufor, 2003. Effect of Toasted Bambara waste (TBW) on performance of growing pullets Proceedings of the 28th Annu. Conf. Nig. Soc. Anim. Prod. (NSAP), pp: 237-239.
- Onyimonyi, A.E. and S.O.C. Ugwu, 2007. Performance of laying hens fed varying dietary levels of bambara (*Voandzeia subterrenea* Thouars) offals. Int. J. Poult. Sci., 6: 223-226.
- Pond, W.G., H.G. Jung and V.H. Varel, 1988. Effect of dietary fibre on young adult genetically lean, obese and contemporary Pigs, body weight, carcass measurement, organ weight and digesta content. J. Anim. Sci., 66: 699-706.
- Steel, R.G.D and J.H. Torrie, 1960. Principle and Procedures of Statistics McGraw-Hill Book Co. Inc. New York.
- Sweenson, M.J. and W.O. Reece, 1993. Dukes Physiology of Domestic Animals. 11th. Edn. Cornell University Press. New York.