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PERFORMANCE CHARACTERISTICS OF BROILERS CHICKENS FED DIETS SUPPLEMMENTED WITH YAM PEEL (*Dioscorea cayenensis*) AS A PARTIAL REPLACEMENT FOR MAIZE

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Abstract

The performance of broiler birds fed with different inclusion levels of yam peel in place of maize was investigated using 60 day old broilers with uniform weight. They were randomly allotted into 4 dietary treatments. The Treatments were replicated 3 times with 5 birds per replicate in a completely randomized design arrangement. Routine vaccination and medication and other standard management practices were strictly observed. Data were collected on different parameters such as initial body weight, final body weight, weight gained, feed intake, feed conversion ratio, tarsal length, and wing length and feed cost per gain (kg). From the study it was observed that birds fed 30% yam peel meal had 1700.00(g) weight and were significantly ($p>0.5$) heavier than those of other treatments. Diet 1 which was maize based served as control and also a standard diet, while yam peel quantitatively replaced maize at 10%, 20%, and 30% in diets 2, 3 and 4 respectively. Each diet was offered *ad libitum* to the broiler birds for 4 weeks. Yam peel meal consist of 89.25 D.M, 12.17 crude protein, 9.3 ash, 6.3 crude fiber, 1.05 crude fat and 3000 Kcal/g M.E while maize consist of crude protein 8.90, ether extract 4.00, crude fiber 2.70, M.E 3432 Kcal/g. This study has shown that the use of yam peel meal in replacement of maize at 30% inclusion level can bring suitable results when fed to broiler chickens. It is therefore recommended that yam peel should be included in broiler feed due to its availability almost all markets and purchase can be made at affordable prices rather than buying maize at higher prices.

Keywords: Broiler, Yam Peel, Performance, Energy, Feed Conversion

Introduction

The increasing pressure on human population and livestock feed companies as resulted in an escalating price of maize in Nigeria. This high price of maize has forced farmers to seek yam peel as an alternative to maize in livestock feeding. Several scientists in Nigeria have shown that yam peel can be used in diet for livestock (Tewe, 1992).

The problem of animal protein scarcity in Nigeria and other developing nations has attained a deplorable status which calls for urgent remedy to avert the imminent malnutrition. This problem has been blamed on high cost of conventional ingredient for feed making which has made monogastric animal feeds a major cost of production (Agbakoba, *et al.*, 1995). Madubuike and Ekenyem, (2001) had rated feeds as constituting 70 - 80% of the cost of poultry production, of which maize constitutes major costs. However, sub-optimal production of the pulses and cereals, giving rise to stiff competition between man and his livestock for the crop product. There is therefore urgent need to explore cheaper alternative feed resources. Some agro by-products have been used in the diets of broiler chicks these include wheat offal and citrus pulp in broiler diets (Faniyi, 2002), palm kernel cake to replace soya bean meal as a protein source in broiler chicken production (Oruseigbio and Wariboko), and the result were encouraging.

Yam belong to the Genius; Discoreae, species; (*D. rotundata*, *D. alata*). Yam peels are wastes or by- product of processing when the tubers are being prepared by human. Yam peel is however, fed to animals such as goats and sheep and largely sourced from yam processing centers or yam sellers.

The usual high inclusion of maize translates into high cost of feed because of seasonality of production and competition between animal and man for maize (Agbede; *et al.*, 2002). According to Bamgbose; *et al.*, (2004) maize account for about 45 to 55% poultry feed. This necessitates the need to replace maize either partially or totally in poultry diet to reduce overall cost. Increasing use of alternatives to maize has been recommended (Obiakonu, 2000).

The greatest proportional cost in livestock production is expanded on feeding with the exception of ruminants animals such as pigs and poultry, feed ingredients represent 65 to 70% of the total cost in an intensive production in Nigeria as in many other developing countries (Gibson, 2006). Energy source constitute between 45 and 60% of finished feeds for this animals and at present, maize is the commonly used source of energy in livestock feed (Crawford, 2001). There is ever increasing pressure on use of maize by human population and livestock feed millers coupled with the cost of maize which fluctuates with the time of the year, thus making the cereal grain to be

either scarce or expensive (Shebba and Padmaja, 1997). The fact necessitate the use of energy that are locally available particularly the starch root and tubers that abound in many area of humid tropics example of which is yam. In addition there by- product such as peels, vines and leaves are non-competitive feed materials that can be develop as component of poultry and pig feed. Presently emphasis has been placed on the expanded programme of yam cultivation; many high yielding varieties of cassava have been developed and released through the improvement effort of IITA and other collaborating institution. This, therefore, suggests that production in excess of direct human consumption will become available for feeding farm animals in Nigeria (Akinfola and Tewe, 2001). Root and tubers are cheap sources of energy (Apata *et al.*, 1999). For example in Nigeria 5% of total yam production is used as feed.

Materials and Method

Experimental site

The experiment was carried out at Grace Poultry Farm, Odo-Ona Elewe, Ibadan in Oluyole Local Government Area of Oyo state, Nigeria. The area is characterized with a mean annual rainfall of about 1037mm, the ambient temperature ranges from 28°C in December to 36°C in February with a yearly average temperature of 34°C. Relative humidity ranges from 60% in January to 94% in August with a yearly average of about 82%. The vegetation represents an interface between the tropical rainforest and the derived savannah.

Experimental bird and management

A total of sixty (60) one-day old unsexed, broilers chicks were purchased at Foresight Farms, Oluyole Extension, Ibadan. The birds were managed under intensive care in deep litter system, routine medications and vaccination programes were observed as specified. The birds were fed with commercial diets for the starter phase (0-4 weeks) before being subjected to the experimental diets at the finisher phase (5-8 weeks). The experiment lasted for 4 weeks, feeds and clean water was supplied *ad-libitum*.

Test ingredient and preparation of sample

The test ingredient of the experiment was yam peel. Yam peel was collected fresh from kitchens and yam processing centers, it was sun dried for ten days until constant dry matter was achieved and this also reduces the enzymatic and microbial reactions leading to spoilage of nutrient leaching. The dry peel is then milled in hammer mill before compounding the feed.

Four different experimental diets were formulated including the standard conventional feed. The diets were designated T_1, T_2, T_3, and T_4 respectively. T_1 was the maize based diet (Control) while T_2, T_3, and T_4 contain 10%, 20%, and 30% of yam peel in place of maize respectively.

Table 1: Composition of experimental diets (g/kg)

Ingredients	**T_1 (0%)**	**T_2 (10%)**	**T_3 (20%)**	**T_4 (30%)**
Maize	48.00	38.00	28.00	18.00
Yam peel	0.00	10.00	20.00	30.00
Soya bean meal	18.00	18.00	18.00	18.00
Groundnut cake	20.00	20.00	20.00	20.00
Fish meal (65% CP)	5.50	5.50	5.50	5.50
Bone meal	5.50	5.50	5.50	5.50
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Vitamins and Mineral Premix	0.25	0.25	0.25	0.25
Limestone	2.00	2.00	2.00	2.00
Salt (NaCl)	0.25	0.25	0.25	0.25

Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated				
Analysis				
M.E. Kcal/kg	2790.80	2443.80	2096.80	1749.80
Crude protein	22.27	21.00	19.73	23.27
Crude fiber	4.02	4.35	4.18	4.51
Lysine	1.18	1.12	1.07	1.02
Methionine	0.38	0.42	0.40	0.44

Table 2: Proximate composition of Yam peel

Constituents	**% (Dry Matter)**
Dry matter	96.00
Crude protein	9.12
Crude fiber	8.38
Ether extract	0.95
Ash	6.80
Nitrogen free extract	74.71
Energy (kcal/kg ME)	3000

Source*:* FUNAAB lab (2015)

Table 3: Proximate composition of the Maize used

Constituents	% (Dry Matter)
Crude protein	8.90
Ether extract	4.00
Crude fiber	2.70
Ash	1.30
Metabolizable energy (kcal/kgME)	3432

Source: **FUNAAB lab (2015)**

Data collection

Growth performance**:** Data were collected on the initial weight of birds, final weight, feed intake and weight gain.

Feed intake (kg) = feed offered (kg) - left over (kg)
Weight gain (Kg) = final body weight (kg) - initial weight (kg)
Feed conversion ratio (FCR): This was obtained by dividing the quantity of feed consumed by the weight gained. All the values obtained for the feed intake and live weight gain were converted to grams and these values represent the amount of feed (g) needed to grow one gram of body weight.

$$FCR = \frac{\text{Total Feed consumed (g)}}{\text{Weight gain (g)}}$$

% Mortality: Mortality is the total number of birds that died during the study. It is usually expressed in percentage (%).

$$\text{Mortality (\%)} = \frac{\text{Number of dead birds}}{\text{Number of birds stocked}} \times 100$$

Tarsal length- This was carried out by using veneer caliper to measure the tarsal length of the birds and placed on a ruler for accurate measurement.

Data Analysis

Data obtained was subjected to statistical analysis of variance (ANOVA) at 5% probability level while Duncan Multiple Range Test was used to separate the means.

Results and Discussion

The results of Growth performance, Tarsal length, Wing length, and Cost analysis of broiler finisher chicken fed different replacement levels of yam peel meal were presented in Table 4, 5, 6, 7 below.

The initial weights of the experimental broiler chicken were similar among the treatments. However, the final weight 1700.00g, 1600.00g, 1533.33g, and 1416.67g for treatment 0%, 10%, 20%, 30% yam peel meal respectively showed that birds on 30% yam peel meal performed best and was significantly heavier ($p<0.05$) than those of other treatments. Also the weight gain increased with increasing levels of yam peel meal in the diets as broilers on 30% yam peel meal gained superior weight ($p< 0.05$) than those on other treatments. This result disagrees with Opara (1996), Iyayi (2001), Ekemyem and Oyeagoro (2006) who observed that additional levels of fiber in diets of animal's depressed growth. This observation could be as a result of low lignin and other complex compound in yam peels thus making the fiber appreciably digestible. It could also be attributed to adequate methionine content in the diets. Oruseigbo and Wariboko (2000) had stated that methionine is a growth promoter as it plays vital role in proper physiological functioning of living organisms.

The feed intake was found to differ significantly ($p< 0.05$), as more feed was consumed by the birds with increasing levels of yam peel in treatment 4. It is therefore possible that the yam peel meal improved palatability of the diets thus making the 30% level inclusion most palatable and acceptable. The lower energy level of diet T_4 30%may have also resulted in highest intake of feeds by birds in their effort to optimize their energy intake (Alozie; *et.al*., 1987).

The feed conversion ratio was found to differ significantly ($p< 0.05$) between treatments, as birds in treatment 2 have the highest figure of 2.79 while the least figure is 2.34 in T_4. This shows that the lower the FCR, the better the efficiency of feed utilization and this will result into increase in the profit margin.

Mortality does not differ significantly among treatments. Mortality occurs at treatment 1 and 3. Most the effect of treatment imposed does not result to mortality.

The tarsal length performance was presented in Table 5. The length was measured per week; week 1 was intermediate as birds in treatment 4 have the highest tarsal length of 3.80 while T_1 has the least. For week 2 T_4, 1, does not differ significantly while T_2 has the least figure of 3.60. For week three, T_4 has the highest figure of 3.95 while other treatment does not differ significantly. For week 4, T_4 has the highest value of 4.15 while other does not differ

significantly. The tarsal length gain of T_4 has the highest value of 0.35 while others do not differ significantly.

The performance of the wing length was recorded weekly. T_4 has the highest value of 6.75 in the 1st week while treatment 2 has the least values of 6.20. For second week treatment 1 and 4 does not differ significantly. in week 3 treatment 1 and 4 do not differ significantly while week 4 it does not differ significantly. For the wing length gain T_2 and 1 have the highest figure of 0.45 and 0.40 respectively while T_4 and 3 has 0.11 and 0.05.

Cost of feed differed significantly ($p< 0.05$) between treatment as lower feed cost were achieved with increasing levels of yam peel meal which resulted in a considerably reduction in the cost of broiler production which in extension makes the product affordable to consumers thereby achieving the major objective of this trial. Cost per kg feed differ significantly as T_1 has the highest cost of 104.1 and T_4 has the least cost of 83.4 feed consumed does not differ significantly, cost per kg feed consumed differ significantly as T_1 has 406.14 and the least cost is 322.50, feed weight gain also vary significantly, feed cost saving naira per kg differ significantly of which T_4 has the highest savings of 20.70 and the least savings is 0.00 of T_4. Feed cost saved differs significantly.

Table 5: Performance characteristics of finisher broiler chickens fed experimental diets (g/kg)

Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**
Initial weight (g)	725.00	725.00	725.00	725.00	1.53
Final weight (g)	1600.00^b	1416.67^d	1533.33^c	1700.00^a	32.05
Total weight gain (g)	875.00^b	691.67^d	795.00^c	973.33^a	32.29
Daily weight gain (g)	31.25^b	24.70^d	28.39^c	34.76^a	1.15
Feed intake (g/ birds)	76.31^{ab}	68.63^c	75.12^b	81.38^a	1.55
Feed conversion ratio (g)	2.44^c	2.78^a	2.65^b	2.34^d	0.05
Mortality (%)	3.33^a	0^a	3.33^a	0^a	1.12

abcd* means with different superscripts within a row are significantly different ($p <0.05$), SEM = Standard Error of Means.

Table 4 shows that there is significant difference in initial body weight among the treatments but birds in T_4 has the highest final weight of 1700.00 while birds in T_2 has the lowest of 1416.67. It also shows that T_4 has the highest daily weight gained of 34.76 while T_2 has the lowest body weight gained of 24.70.The result above it shows that T_4 has highest number of feed intake of 81.36 followed by T_1 which is 76.3, T_3 75.12 while T_2 has the least value of 68.63. T_4 has the highest value of feed conversion ratio which is 2.34. Followed by T_1that has 2.44 as FCR, T_3 has 2.65 and T_2 has the lowest FCR OF 2.78. There is no significant difference in mortality because the mortality that occurs may not be attributed to the feed given

Table 6: Tarsal length of the finisher broilers chickens fed experimental diets

Parameters	T_1	T_2	T_3	T_4	SEM
Tarsal length (cm)	3.55^{c}	3.65^{b}	3.60^{bc}	3.80^{a}	0.03
Mean of tarsal length week 2 (cm)	3.75^{a}	3.60^{b}	3.75^{a}	3.78^{a}	0.02
Mean of tarsal length week 3 (cm)	3.75^{b}	3.80^{b}	3.75^{b}	3.95^{a}	0.03
Mean of tarsal week 4 (cm)	3.75^{b}	3.83^{b}	3.74^{b}	4.15^{a}	0.05
Mean of tarsal length gain	0.20^{b}	0.18^{b}	0.14^{b}	0.35^{a}	0.03

abcd* means with different superscripts within a row are significantly different ($p < 0.05$), SEM = Standard Error of Means.

T_4 has the highest tarsal length at the overall week, the values of tarsal length of parameters of birds on 10%, 20%, 30% level also differ significantly. The performance of the tarsal length was presented in table 5 below: the length was measured per week; week 1 was intermediate as birds in treatment 4 have the highest tarsal length of 3.80 while T_1 has the least. For week 2 T_4, 1, does not differ significantly while T_2 has the least figure of 3.60. For week three, T_4 has the highest figure of 3.95 while other treatment does not differ significantly. For week 4 T_4 has the highest figure of 4.15 while other does not differ significantly. The tarsal length gain of T_4 has the highest figure of 0.35 while others do not differ significantly.

Table 7: Wing length of the finisher broilers chickens fed experimental diets

Parameters	T_1	T_2	T_3	T_4	SEM
Mean of wing length week 1	6.45^{b}	6.20^{c}	6.50^{b}	6.75^{a}	0.06
Mean of wing length week 2	6.65^{a}	6.45^{b}	6.50^{b}	6.70^{a}	0.04
Mean of wing length week 3	6.80^{a}	6.61^{ab}	6.48^{b}	6.75^{a}	0.05
Mean of wing length week 4	6.85^{a}	6.65^{b}	6.55^{b}	6.85^{a}	0.05
Mean of wing length gain	0.40^{a}	0.45^{a}	0.05^{b}	0.11^{b}	0.06

abcd* means with different superscripts within a row are significantly different (p <0.05), SEM = Standard Error of Means.

Wing length differ significantly between treatments for the first week, as T_4 has the highest value of wing length, while in the second week T4 performed best , . Treatment 4 also had the highest result in the third week At the fourth week T_1 and T_4 has the same values of wing length.

Table 8: Cost analysis of the experimental birds

Parameters	T_1	T_2	T_3	T_4	SEM
Cost/kg/feed (N)	104.14^a	97.24^b	90.34^c	83.44^d	2.92
Feed consumed (kg)	3.90^b	3.89^b	3.97^a	3.99^a	0.02
Cost/ kg/ feed consumed (N)	406.14^a	378.74^b	358.56^c	332.50^d	10.21
Cost/ weight gain (N/kg)	119.01^b	144.06^a	116.57^c	85.57^d	7.84
Feed cost saving (N/ kg)	0^d	6.90^c	13.80^b	20.70^a	2.92
Feed cost saved (%)	0^d	6.63^c	13.25^b	19.88^a	2.77

abcd* means with different superscripts within a row are significantly different (p <0.05), SEM = Standard Error of Means.

Cost of feed differed significantly (p< 0.05) between treatment as lower feed cost were achieved with increasing levels of yam peel meal which resulted in a considerably reduction in the cost of broiler production which in extension makes the product affordable to consumers thereby achieving the major objective of this trial. Cost per kg feed differ significantly as T_1 has the highest cost of 104.1and T_4 has the least cost of 83.4.feed consumed does not differ significantly, cost per kg feed consumed differ significantly as T_1 has 406.14 and the least cost is 322.50, feed weight gain also vary significantly, feed cost saving naira per kg differ significantly of which T_4 has the highest savings of 20.70 and the least savings is 0.00 of T_4. Feed cost saved differs significantly.

Conclusion and Recommendations

Yam peel meal could be included in broiler chickens diet up to 30% without any deleterious effect on overall performance and carcass yield. Inclusion of yam peel meal on broiler finisher ration significantly reduced total cost of feed in poultry industry which by extension makes poultry meat more affordable to consumers since there is reduction in the price of the product. However further studies should be carried out to know at what point above 30% that yam peel meal may be included to replace maize in broilers diet

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