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Effect of Partial Replacement of Yam Peel Meal *Dioscorea Spp.* for Maize Meal *Zea mays* on Performance and Carcass Characteristics of Finisher Broiler Chicks

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Abstract: One hundred and sixty 4-week old Anak 2000 broiler chicks were used in a 28-day feeding trial to evaluate the effect of partial replacement of yam peel meal (YPM) for Maize Meal (MM) in the performance and carcass characteristics of finisher broiler chicks. Birds were grouped into four treatments and fed diets containing 0%, 5%, 10% and 15% YPM. The treatments were replicated four times in a completely randomized design. Feeding and potable water supply were *ad libitum*. Routine vaccination and medication and other standard management practices were strictly observed. Data collected were performance parameters such as initial weight, final weight, weight gain, feed intake, feed conversion ratio and feed cost per kg gain while carcass parameters such as dressed weight, breast weight, thigh weight, wings, shank and head were measured. Results show that birds fed 15% YPM 1737.50g were significantly (P<0.05) heavier than others fed 0% YPM 1650.00g, 5% YPM 1637.50g and 10% YPM 1675.00g thus showing heavier weight with increasing levels of YPM in the diets. Similar trend was also observed in weight gain in which birds fed 15% YPM made significantly (P<0.05) superior gain to birds on the rest diets. Cost of feed/kg gain significantly (P<0.05) reduced with increasing levels of YPM. All carcass parameters show significant (P<0.05) differences between treatments in favour of birds fed higher levels of YPM. Thus the inclusion of YPM in diets up to 15% improved the performance and carcass characteristics of the birds as well as significantly (P<0.05) reduced the cost of feed/weight gain.

Key words: Yam peel meal, Maize meal, partial replacement, Broiler chick diets, carcass characteristics

Introduction

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 protein malnutrition. This problem has been blamed on high cost of conventional ingredients for feed making which has made monogastric animal feed major cost of production (Agbakoba *et al*., 1995). Madubuike and Ekenyem (2001); Faniyi (2002) 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 products, (Tegbe *et al.,* 1984, Madubuike, 1992; Akinfola and Tewe, 2002; Babatunde *et al.,* 1990) appears to be largely responsible for the high cost of feed ingredients.

There is therefore urgent need to explore cheaper alternative feed resources. Some agro by-products have been used in the diets of broiler chicks, including wheat offals and citrus pulp in broiler diets (Faniyi, 2002), palm kernel cake to replace soyabean meal as a protein source in broiler chicken production (Oruseibio and Smile, 2002), and the results were encouraging.

Yam peels are basic wastes or by-products when yam is peeled during processing for cooking and other purposes. Yam peels are however, fed to animals such as goats and sheep and largely sourced from yam processing centres, or kitchens. Yam peels may be fed directly soon after peeling, or sun dried for 4 – 7 days depending on ambient temperature, to dehydrate it thereby preventing microbial fermentation of the product or fungal infestation. Scott (1987) had stated that the level of moisture required to prevent microbial growth in yam peels was below 12%. The objective of this trial is to evaluate the performance and carcass characteristics of finisher broiler chicken fed partial replacement of yam peel meal (YPM) for maize meal (MM) with a view to ascertaining its potentials for reducing the cost of chicken production and by extension making animal protein affordable for Nigerians.

Materials and Methods

The experimental site: The trial was carried out at the Poultry unit of the Imo State University Teaching and Research Farm, Owerri, Nigeria, situated on Longitude 7°01^{l}, 06^{l}E and 7°3^{l} 00E and Latitude 5°28^{l} 24°N and 5°30l 00^{l}N (Ekenyem and Onyeagoro, 2006).

Preparation of yam peel meal (YPM): Yam peels were collected fresh from kitchens, yam processing centres and partial-spoiling yams from yam barns, each peel measuring between 0.5mm-5mm thickness, dehydrated by sun drying for 4-7 days to reduce enzymatic and microbial reactions leading to spoilage and nutrient leaching. The peel can also be oven dried by placing it

Table 1: Proximate composition of yam peel meal

Nutrient %	Proximate Composition
Ash	6.80
Moisture content	10.14
Ether extract	0.95
Crude protein	9.14
Crude fibre	8.40
Energy kcal/kg ME	3.000

at 50^{0}C for 1 hour until it becomes crispy. The dry peel is then milled in hammer mill with 3.15mm mesh size before compounding the feed.

Experimental feed compounding: Proximate analysis of the YPM was first done at the Biochemistry Laboraory of the Michael Okpara University of Agriculture, Umudike, Nigeria according to AOAC (1995) to determine the crude protein, gross energy, ether extract, and crude fibre (Table 1). It was then incorporated into the experimental diets at replacement levels of 0%, 5%, 10% and 15% for maize meal (MM). The diets so compounded were iso-nitrogenous (21% crude protein) and differing in energy levels of 2870kca/kg ME through 2474.21kcal/kg ME for treatment 1-4 (Table 2).

The experimental animals: brooding and rearing: A total of 180 Day Old Anak 2000 broiler chicks obtained from a local dealer were brooded for four weeks according to Omeje and Ekenyem (1999) using a commercial broiler starter diet. After the 4th week, 160 4-week old experimental birds were selected based on sound physical strength and good health and divided into four treatments which were further replicated four times in a completely randomized design. Potable water and the finisher diets were administered *ad libitum* in appropriate troughs while routine medication and vaccinations were applied as appropriate.

Data collection and analysis: Liveweights of the birds were taken at the start of the trial and weekly thereafter with Salter weighing scale. The daily feed intake of each replicate was measured by subtracting the leftover feed from the feed supplied. The final liveweight is measured as the weight of birds at the termination of the experiment while the liveweight gain was calculated by subtracting the initial weights from the final weights. Also the feed conversion ratio was calculated as below.

Feed conversion ratio = [feed intake / Weight gain]

Feed cost per kg gain was calculated by summing the cost of each ingredient that was included to make 1kg of feed per treatment in order to determine the cost effectiveness of the various treatment diets. At the end of the experiment, one bird was randomly picked from each replicate, starved of food for 24 hours but not water, and slaughtered by cutting the jugular to achieve thorough bleeding. The birds were eviscerated after plucking their feathers in warm water. Carcass characteristics were evaluated by properly dissecting the carcass into parts and weights measured as percentage of liveweight. The dressed weight, thigh weight, wing weight and shank and head weight were measured by the methods of (Ojewole *et al.,* 2000).

All data were processed and subjected to one-way analysis of variance according to Steel and Torrie (1980) while differences in treatment means were separated using the Duncan's multiple range test as outlined by Onuh and Igwemma (1998).

Results and Discussion

Results of performance and carcass characteristics of the finisher broiler chicks fed different replacement levels of yam peel meal for maize meal are presented in Table 3.

The initial liveweights of the experimental broiler chicken were similar (P>0.05) between treatments. However, the final liveweight 1650.00g, 1637.50g, 1675.00g and 1737.50g for treatments 0%, 5%, 10% and 15% YPM respectively showed that birds on 15% YPM were significantly (P<0.05) heavier than those of other treatments. Also the liveweight gain increased with increasing levels of YPM in the diets as broilers on 15% YPM gained superior weight (P<0.05) to those on the rest treatments. The results disagree with Opara (1996), Iyayi (2001), Ekenyem (2006), Ekenyem and Madubuike (2006) who observed that additional levels of fibre in diets of animals depressed growth. This observation could be as a result of low lignin and other complex compounds in yam peels thus making the fibre appreciably digestible. It could also be attributed to adequate methionine content of the diets. Oruseibio 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) between treatments, as more feed was consumed by the birds with increasing levels of YPM. It is therefore possible that the YPM improved palatability of the diets thus making the 15% level most palatable and acceptable. The lower energy level of diet T_4 15% YPM may have also caused its highest intake by birds in their effort to optimize their energy intake (Alozie *et al.,* 1987).

The rates of feed conversion were not statistically different (P>0.05).

Cost of feed differed significantly (P<0.05) between treatments as lower feed costs were achieved with increasing levels of YPM which resulted in a considerable reduction in the cost of broiler production which in extension makes the product affordable to consumers thereby achieving the major objective of this trial.

The results of carcass characteristics of the experimental birds show that significant differences (P<0.05) occurred between treatments on all the

Table 2: Ingredients Composition of the Experimental Finisher Broiler Diets

Ingredients	Treatments (% yam peel meal)			
	T_1	T_2	T_3	T_4
	0%	5%	10%	15%
Maize	50	45	40	35
Yam peel meal	0	5	10	15
Brewers Dried grain	12	12	12	12
Soyabean meal	26	26	26	26
Palm kernel cake	5	5	5	5
Blood meal	3	3	3	3
Bone meal	3	3	3	3
Vitamin premix	0.25	0.25	0.25	0.25
Fish meal	0.50	0.50	0.50	0.50
Common salt	0.25	0.25	0.25	0.25
Calculated Nutrient Composition of the Diets				
Crude Protein	21.56	21.51	21.50	21.43
Crude fibre	5.74	6.07	6.39	7.73
Ether Extract	12.25	12.10	11.94	11.79
Methianine	0.35	0.45	0.55	0.65
L-Lysine	1.22	1.42	1.62	1.81
ME Kcal/kg	2870.39	2738.33	2606.27	2474.21
Mineral Content of the Diets				
Calcium	1.22	1.22	1.22	1.22
Phosphorus	0.70	0.70	0.70	0.70

Premix supplied per kg of feed: Vit. A 10,000 iu, Vit. D_3 2000 iu, Vit. E 5 iu, Vit. K 2mg, riboflavin 4.20mg, Vit. B_{12} 0.01mg, Panthothenic acid 5mg, Micotic acid 20mg, folic acid 0.5mg, chlorine 3mg, Mg 55mg, Fe 20mg, Cu 10mg, Zn 50mg, Co 125mg, iodine 0.8mg.

Table 3: Performance and Carcass Characteristics of the Experimental Finisher Broiler Chicken

Parameter	Treatments with % YPM				
Performance	T_1 %	T_2 5%	T_3 10%	T_4 15%	SEM
Initial liveweight (g)	725.00[a]	725.00[a]	725.00	725.00	0.32
Final liveweight (g)	1650.00[a]	1637.50[a]	1675.00[a]	1737.50[b]	0.044
Daily liveweight gain (g)	925.00[b]	912.50[b]	950.00[b]	1012.50[a]	0.033
Daily feed intake (g)	140.00[c]	145.00[b]	147.50[b]	155.00[a]	0.003
Feed conversion ratio	4.28[a]	4.46[a]	4.36[a]	4.31[a]	0.208
Cost of feed/weight gain (N)	120.04[a]	115.30[b]	103.20[c]	96.90[d]	1.004
Carcass Characteristics:	---------- (% final liveweight) ----------				
Full dressed weight	69.70[a]	66.76[c]	68.66[b]	70.23[a]	1.100
Breast weight	12.12[b]	11.52[c]	11.52[c]	11.95[c]	0.36
Thigh weight	6.42[a]	5.22[c]	5.73[b]	5.90[b]	0.78
Wings	6.67[a]	5.18[d]	5.35[c]	5.97[b]	0.25
Shank and head	8.96[b]	8.48[b]	8.63[b]	9.16[a]	1.20

NB: US $ 1 = N128.00. abcd: means within same row with different superscripts are significantly different (P<0.05)

parameters with birds on the control diets 0% YPM consistently having higher values. The values of carcass parameters for birds on 5%, 10% and 15% level also differed (P<0.05) between themselves showing higher values with increasing YPM. This agrees with Splitstoesere *et al.* (1973) who stated that birds placed on yam peels diets had faster rate of metabolism and thus growth. Also the increasing percentages of carcass parts to the final liveweight show that higher levels of yam peels promoted higher percentages of the parts on the final weight.

Conclusion and recommendations: Yam peel meal could be included in broiler chick diets up to 15% without any deleterious effect. Higher replacement levels of YPM for MM yielded better results in performance and carcass characteristics. Inclusion of YPM in broiler finisher ration significantly (P<0.05) reduced cost of feed consequently reducing the cost of poultry production which by extension makes poultry products affordable to consumers.

Further research should be conducted to determine the optimum inclusion levels of YPM in poultry diets by including higher levels in future trials. Also research should be directed towards the safe storage of YPM and how to intensify yam production.

Finally, good extension techniques should be adopted by stakeholders in animal production and nutrition to

educate farmers on such cheap means of poultry production.

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