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Apparent nutrient digestibility of broiler starter fed varying levels of processed taro cocoyam *(Colocasia esculenta)* meal based diet

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Abstract

A ten-week feeding trial was conducted to evaluate the apparent nutrient digestibility of 120, one-day old broiler starter chicks fed varying levels of Parboiled sundried taro cocoyam (Colocasia esculenta) meal (PSCM). Four treatments were formulated with diet one containing 100% maize as control, while in diet two, three and four parboiled sundried cocoyam meal (PSCM) replaced the percentage proportion of maize in diet one at 50, 75 and 100% inclusion levels respectively. Thirty (30) birds were randomly assigned to the four treatment diets in a complete randomized designed (CRD) and each treatment group contained three replicates with ten (10) birds each. Ground fed feed and voided faecal samples collected after a 4-day feeding in a metabolic cage were analyzed for their respective proximate constituent. Apparent nutrient digestibility revealed that crude fibre was significantly (P<0.05) higher in diet 4 while crude ash was significantly (P<0.05) higher in control. Digestible ether extract and NFE were significantly (P<0.05) higher among birds placed on 50% PSCM. It is therefore concluded that parboiled sundried taro cocoyam meal (PSCM) could replace 50% of maize in broiler starter diet without any deleterious effect. However, substituting maize with parboiled sundried taro cocoyam meal at 50% replacement level improved nutrient digestibility and is hereby recommended for poultry farmers.

Keywords: Broiler Starter, Taro Cocoyam, Nutrient digestibility, Parboiled-Sundried

Introduction

Inadequate poultry and livestock feed supply and nutrition had been identified as the major constraint to poultry and livestock production in Nigeria. This is so because the conventional livestock feedstuffs sources have been very expensive especially in monogastrics diets. However, the search for locally available feedstuffs that can substitute these conventional energy/ protein feed ingredients at cheap cost is imperative. The need to boost animal production to produce the much needed protein for the ever increasing human population in the developing countries cannot be over emphasized. (FAO, 2007). Recently, effort has been geared towards the use of unconventional feed stuff such as agro-industrial by products and root tubers like yam, cocoyam etc. that may bring about the expected reduction in livestock feed cost and consequently poultry or livestock products (Aderemi, 2003). Several reseachers have reported their success stories on the use of unconventional feed ingredients. Okosun and Eguaoje, (2017) also reported that Cassava grit at 66.6% level of inclusion with 5% moringa leaf meal supplementation resulted in better biological performance in cockerel chickens. Omoikhoje (2004) reported that cooked Bambara groundnut meal was not nutritionally inferior to groundnut cake diet

and can quantitatively replace groundnut cake up to 10% level of inclusion without any adverse effect on broiler chickens due to the level of aldosterol in cooked Bambara groundnut meal. Ehebha and Eguaoje, (2018) reported that sundried cassava peel can be included up to 20% in broiler chickens diet without any deleterious effect on the performance of the birds. Anigbogu (1997) reported that taro meal should not exceed 25% replacement of maize in broiler diets. Consequently, this present study is focused on the use of cocoyam meal as basal diet in poultry diet. The use of cocoyam as food for man and animal has limiting factors such as storage and presence of antinutritional factors such as oxalates, phytates, tannins and saponins. (Agwunobi *et al*., 2002). There is limited reference work on the utilization and inclusion of taro cocoyam as an alternative energy source in poultry production. However, this present study is therefore aimed at evaluating the apparent nutrient digestibility of starting broiler fed graded levels of parboiled sundried taro cocoyam meal based diet.

Materials and methods

Location and duration of the experiment

The research was conducted at the poultry unit of the Livestock Teaching and Research Farm of Agricultural Science Education Department, Adeniran Ogunsanya College of Education, Oto/Ijanikin, Lagos State, Nigeria for the period of ten weeks.

Sourcing and processing of the raw materials

The unpeeled Taro cocoyam cormel used for the feeding trial was purchased from local market in Ijanikin, Lagos, Nigeria and thereby village market. It was then chopped into aliquots of about 1mm and parboiled for about 15mins then drained of water and was air dried overnight then later sundried for 7-14 days to reduce the moisture content to about 10% or less. The parboiled-sundried Taro cocoyam and other feed ingredients were milled separately and to formulate the experimental diet. Sample was taken from the processed Taro cocoyam and was kept in an airtight polythene bag and taken to the laboratory for proximate analysis.

Chemical analysis of the processed raw material

The moisture content, ash, crude fibre and crude fat, were determined using the method described by AOAC (1990). The crude protein was also determined by Kjeldahl method while energy value was determined using an Adiabatic Oxygen Bomb calorimeter (12149) Adiabatic calorimeter, PARR instrument Co. Illinois USA. The result is presented in Table 1.

Table 1: Proximate composition of taro cocoyam and maize

Components	PSCM	Maize
Dry matter	87.62	89.80
Crude protein	7.87	8.94
Crude fibre	4.75	2.76
Ether extract	0.76	4.34
Crude ash	6.05	2.01
NFE	68.37	71.75
Carbohydrate	45.06	26.54
ME (Kcal/kg)	3214.91	3325.42

Analyzed; PSCM: Parboiled sundried Cocoyam meal

Experimental animals, design and management

One hundred and twenty (120) one-day old ANAK 2000 broiler chicks were purchased from a reputable hatchery in Ibadan south west Nigeria. The design of the experiment was a completely randomized design (CRD) comprising of four (4) treatment diets with treatment one being the control with 100% inclusion level of maize and 0% parboiled sundried taro cocoyam meal (PSCM) while diets 2, 3 and 4 had inclusion levels of parboiled sundried Taro cocoyam meeal (PSCM) at 50, 75 and 100% respectively. Each treatment diets had thirty birds of ten birds per replicate. Experimental birds were fed commercial diet for the first two weeks during brooding. All animals were allowed assess to feed and clean drinking water *ad-libitum* and routine medication and vaccination was adhered to. All the diets (1 to 4) were formulated to be isonitrogenous (21%) and isocaloric (2890 ME Kcal/kg) as reflected in Table 2

Table 2: Percentage composition of broiler starter diets

	Inclusion levels of PSCM (%)			
	0	50	75	100
Maize	48.00	24.00	12.00	0.00
PSCM	0.00	24.00	36.00	48.00
Soya bean meal	35.00	35.00	35.00	35.00
Wheat offal	7.50	7.50	7.50	7.50
Fish meal	5.00	5.00	5.00	5.00
Dicalcium phosphate	2.50	2.50	2.50	2.50
Palm oil	1.00	1.00	1.00	1.00
Premix	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Crude protein	21.03	21.02	21.04	21.09
ME (Kcal/kg)	2885.00	2875.00	2892.00	2880.00

Apparent digestibility of nutrients

At the expiration of the experiment, two birds per replicate were randomly selected and housed individually in a metabolic cage. A 5-day acclimatization period were allowed prior to a 4-day collection period; thereafter the birds were fed the specific quantities of the treatment diets. Daily excreta voided per bird were collected and dried over night at 60^0c for 12 hours and kept frozen (-20^0C) until it's ready for analysis. Prior to analysis, Excreta sample was dried at 65^0C in an air-tight oven to a constant weight and ground through a 1mm screen for proximate analysis. Ground fed feed and voided faecal samples were analyzed for their respective proximate constituent. (AOAC 1990). Apparent digestibility of dry matter, crude protein, crude fibre, ether extract, ash and Nitrogen free extract were estimated using the formular below.

$$\text{Apparent nutrient digestibility} = \frac{\text{Nutrient in feed} - \text{Nutrient in feaces}}{\text{Nutrient in feed}} \times \frac{100}{1}$$

Statistical analysis

All data were subjected to a one-way analysis of variance (ANOVA) and differences between means and treatments were seperated using Duncan's multiple range test (DMRT) at 5 percent level of

probability. All statistical procedures were according to (Steel and Torrie, 1990) with the aid of SAS 1999 package.

Results

Table 3 revealed that the varying levels of parboiled sundried taro cocoyam meal (PSCM) has no significant (P>0.05) effect on the apparent digestible dry matter content and crude protein content but a significant (P<0.05) variation was observed for crude fibre, ether extract, crude ash and Nitrogen free extract (NFE) of the treatment diets. Dry matter and crude protein content were statistically similar (P>0.05) among broiler chickens fed the treatment diets with highest numerical values recorded from chickens on 50% PSCM based diets. Apparent digestible crude fibre was significantly (P<0.05) highest with an average value of 70.03% in chickens fed 100% PSCM, followed by 68.33% from those on 75% PSCM comparable to 65.21% from those on 50% PSCM while lowest value of 61.26% was recorded in broiler chickens on the control. Apparent digestible ether extract was significantly (P<0.05) highest with an average value of 85.26% in birds fed 0% PSCM, compared to 84.62% to those in 50% PSCM while lowest value of 76.44% was recorded in birds on 100% PSCM. Apparent digestible crude ash was significantly (P<0.05) with highest value of 49.83% in birds fed 50% PSCM, followed by 47.44% from those fed the control diet while lowest value of 43.63% was recorded in broiler chickens fed 75% PSCM. Nitrogen free extract value was also significantly (P<0.05) higher among birds fed 50% PSCM with an average value of 57.16%, followed by 52.44% from those on 100% PSCM while lowest value of 50.63% was recorded in chickens fed the control diet.

Table 3: Apparent n utrient digestibility of broiler chickens fed parboiled sundried cocoyam meal

Parameters	0	50	75	100	SEM±
App. Digestible dry matter	66.40	67.21	66.52	66.83	0.32
App. Digestible crude protein	54.26	55.80	54.64	54.26	0.45
App. Digestible crude fibre	61.26^{c}	65.21^{b}	68.33^{b}	70.03^{a}	6.25
App. Digestible crude ash	85.26^{a}	84.62^{a}	78.43^{b}	76.44c	5.36
App. Digestible ether extract	47.44^{ab}	49.83^{a}	42.63^{c}	46.26b	3.30
App. Digestible NFE	50.63^{d}	57.16^{a}	51.26^{c}	52.44b	7.32

abc: means in the same row with varying super script differ signifi cantly (P<0.05)

Discussion

High dry matter content though not significant corroborate the report of Longe and Ogedengbe (1999) that diluting diet with fibre sources contributes largely to the bulkiness of the resultant diet. This is also in tandem with the report of Eguaoje and Okosun (2017) that there was no significant difference in the dry matter content of the birds fed cassava grit supplemented with moringa leaf meal. The insignificant (P>0.05) variation in the apparent digestible crude protein among the treatment diet may be due to high quality of the diet as apparent crude protein digestibility has been reported to depend on the source and concentration of the protein in the feed stuff (Mc Donald *et al.,* 1991). However, this finding negates the report of Aguihe *et al.* (2015) on significant variation in the digestible crude protein of broiler chickens fed cassava peel meal based diet with enzyme Maxigrain® supplementation. The highest digestible crude fibre recorded among birds fed 100% parboiled sundried taro cocoyam meal could be as a result of the high fibre content of the basal diet as cocoyam is known to be high in fibre (Apata and Babalola, 2012).

Aguihe *et al.* (2015) similarly reported a

significant variation in the digestible crude fibre of broiler chickens fed cassava peel meal based diet with enzyme Maxigrain® supplementation. Higher ash content recorded in the control compared to those on 50% PSCM may be attributed to the presence of minerals, indicating that PSCM may be a potential source of minerals. This observation agreed with Gernah *et al.* (2007) that Locust bean pulp (LBP) was a good source of minerals required by the body. The significant variation in the ether extract content with higher value recorded among birds on 50%PSCM compared to those on control could be due to the high energy value of the basal diet and maize. The improvement in apparent digestibility of NFE recorded among birds placed on 50% PSCM may be due to the high energy content of the dietary treatment which agreed with the report of earlier authors (Aderemi 2007; Aguihe *et al.,* 2017; Eguaoje and Okosun, 2017).

Conclusion

It is therefore concluded that parboiled sundried taro cocoyam meal (PSCM) could replace 50% of maize in broiler starter diet without any deleterious effect. However, substituting maize with parboiled sundried taro cocoyam meal at 50% replacement level improved nutrient digestibility and is hereby recommended for poultry farmers.

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