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Growth performance of broiler chicks fed graded levels of processed taro cocoyam *(Colocasia esculenta)* meal based diet

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Abstract

An eight-week feeding trial was conducted to evaluate the growth performance characteristics of (120) broiler starter 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 level respectively. Thirty (30) birds were randomly assigned to the four treatment diets in a completely randomize designed (CRD) each treatment group comprising of three replicates with ten (10) birds each. Growth performance revealed a significant variation (P<0.05) in the values of final live weight, daily feed intake and weight gain with highest value (1.62kg, 480.00g and 62.00g/bird) among those fed 50% PSCM. Feed conversion ratio (13.02) was least and best among those on 50% PSCM and protein efficiency ratio was higher (0.06) among those fed the control. It is concluded therefore from this study that parboiled sundried taro cocoyam meal is a valuable replacement for maize up to 50% in broiler diets without adverse effects on the growth performance of starting broiler chickens.

Keywords: *Broiler Chicks, Taro Cocoyam, Growth Performance, Parboiled-Sundried*

Introduction

The interest of developing countries in promoting the production of fast growing animals such as poultry came as a result of increasing demand for animal protein (Obinne and Okorie, 2008). In country like Nigeria, the difference between production and consumption of animal protein is below the recommended level. This poses threat to food security and may lead to malnutrition. Thus to avert this trend several attempts has been made to increase animal production in the country to bridge the gap. Most of the effort was directed towards poultry production. The policy to expand the production of poultry is seen as surest way of bridging the gap between production and consumption of animal protein (Adesehinwa, 2008). In poultry production about 70% of the total cost can be attributed to feeding cost (Banson *et al.,* 2015). The high cost of feed is attributed to the competition for conventional feedstuff for competing usage particularly protein feed ingredients such as maize, soya bean meal and Fish meal. Over the years, researchers have recorded their success stories on the use of tuber crops like cassava. Tuleum *et al,* (2005) reported that inclusion of 50% cassava root meal/brewer yeast slurry as replacement for broiler chicks and is found to reduce the current pressure of maize and price of finished product. Furthermore

Okosun and Eguaoje, (2017) and Ehebha and Eguaoje, (2018) reported the use of its peel as energy source in broiler diet. On the other hand, **t**aro cocoyam is a less well known source of energy, which is not in great demand for human food (Agwunobi *et al.,* 2002) and can also serve as an energy source in broiler diet. Cocoyam products are recognized as cheaper carbohydrate sources than grains or other tuber crops (Obioha, 1972). It has high caloric yield per hectare, low production cost (Hahn, 1984) and relatively low susceptibility to insect and pest attack. Similarly, it is reported that cocoyam has readily digestible starch content because of its small particle size (Lyonga and Nzetchueng, 1986; Ezedinma, 1987). The use of cocoyam as food for man and animal has limiting factors such as storage and presence of antinutritional factors. The antinutritional factors found in taro cocoyam include oxalates, phytates, Tannins and Saponins. (Agwunobi *et al*., 2002) which serve as defensive mechanism against pests and diseases. Therefore oxalates have been found to be as defense mechanism and a storage reserve for calcium (Smith, 1982). However, there is limited reference work on the utilization and inclusion of taro cocoyam as an alternative energy source in poultry production. However, Anigbogu (1997) reported that taro meal should not exceed 25% replacement of maize in broiler diets. This current study is therefore geared toward assessing the growth performance of broiler chicks fed graded levels of parboiled sundried taro cocoyam meal based diet as replacement for maize.

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 eight weeks.

Sourcing and processing of the raw materials

The unpeeled taro cocoyam tubers used for the feeding trial were purchased from local market in Ijanikin, Lagos, Nigeria. They were chopped into aliquots of about 1mm and parboiled for about 15mins, drained, air dried overnight and later sundried in batches 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. Samples were taken from the processed taro cocoyam and were 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	4.57	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) 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. Treatment one control contained 100% maize as energy source, while treatments 2, 3 and 4 contained parboiled sundried Taro cocoyam meal (PSCM) at 50, 75 and 100% respectively as replacement for maize. Each treatment diets had thirty birds of ten birds per replicate. Experimental broiler chickens werefed commercial diet for the first two weeks during brooding. The chickens 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 (2650 and 2250 ME Kcal/kg) as reflected in Table 2.

Table 2: Percentage composition of broiler starter diets

	Inclusion levels of PSCM (%)			
Parameters	**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

PSCM: Parboiled sundried cocoyam meal

Growth performance

During the feeding trial, daily feed consumption, weight changes and mortality were recorded while weight gain, feed conversion ratio and protein efficiency ratio were estimated.

Statistical analysis

All the data collected were subjected to a one way analysis of variance (ANOVA) and differences between treatment means were seperatated using Duncan's Multiple Range Test (DMRT) at 5 percent level of probability. All statistical procedures were according to Steel and Torrie, (1990) using SPSS Version 20.

Results and discussions

Growth performance

The performance of the broiler chickens on varying levels of parboiled sundried taro cocoyam meal as a substitute for maize is presented in tables 3 and it revealed a significant ($P<0.05$) difference in final live weight, daily feed intake, daily weight gain, feed conversion ratio as well as protein efficiency ratio. Average final live weight was significantly higher (1.62kg/bird) among chickens placed on 50% parboiled sundried cocoyam meal (PSCM), followed by comparable mean value of 1.42kg/bird in broiler chickens fed the control, while lowest value of 1.24kg/bird was recorded

among those fed 100% PSCM. The higher live weight recorded among birds fed 50% PSCM could be due to the higher feed intake that led to the higher weight gain translating to the higher live weight. This finding is in tandem with the report of Akinmutimi and Usuagwu, (2008) on significant variation in the final live weight value of weaner rabbits fed processed sweet potato meal. Daily feed intake was significantly higher (480g/bird) among birds placed on 50% parboiled sundried cocoyam meal (PSCM), followed by 370g/bird in bird fed 0% PSCM while lowest value of 260g/bird was recorded among broiler chicken fed 100% PSCM. The higher feed intake recorded among birds fed 50% PSCM could be due to the nutritional adequacy of the test diet. This is in line with the report of (Akinmutimi, 2004; Akinmutimi *et al.,* 2006) who reported a significant difference in the final live weight of broiler chickens fed graded levels of sword beans. Daily weight gain was significantly higher among broiler chickens placed on 50% PSCM with mean value of 50.0g/bird, followed by 40.0g/bird in bird fed the control while lowest values of 30.0g/bird was recorded among those fed 75 and 100% PSCM, respectively. The higher weight gain recorded among birds on 50% parboiled sundried cocoyam meal could be the availiability and density of nutrients in the diet which led to higher feed intake translating to higher weight gain. This however negates the finding of Abdulrashid and Agwunobi (2009) who observed no significant (P>0.05) difference in the weight gain value of broiler chickens fed processed taro cocoyam meal based diet. Feed conversion ratio was higher from those on 100% PSCM with mean value of 18.23, followed by 17.20 among birds fed 75% PSCM comparable to 16.04 among those fed control while lowest but best value of 13.20 was recorded among those fed 50% PSCM. The least feed conversion ratio recorded among birds on 50% PSCM is a pointer to the fact that the processing method adopted in this study could have reduced the antinutritional factor such as phytate and oxalate (Agwunobi*et al.,* 2002) which brought about optimum utilization of the test diet. Ogun *et al.,* (1989); Abdulrashid and Agwunobi. (2009) reported that parboiling and other traditional method of processing such as sundrying could cause significant reduction in these toxicants (Oxalates) which bound the nutrient in feed and thereby increasing palatability of the feed thereby increasing the utilization of the feed. Protein efficiency ratio also showed significant variation with higher (0.06) value found among the broiler chicken on the control diet, followed by 0.04 in birds fed 50% PSCM while lowest value of 0.03 was recorded among those fed 75 and 100% PSCM respectively. The highest protein efficiency ratio recorded among birds on the control and the decrease in the PER

Table 3: Growth performance characteristics of broiler chickens

	Inclusion levels of PSCM (%)					
Parameters	**0**	**50**	**75**	**100**	**SEM±**	**LOS**
Initial weight (g/bird)	85.60	85.57	85.55	85.27	0.23	NS
Final live weight (kg/bird)	1.42^{ab}	1.62^{a}	1.26^{c}	1.24^{c}	0.07	*
Daily feed intake (g/bird)	370.00^{b}	480.00^{a}	290.00^{c}	260.00^{d}	22.43	*
Dailly weight gain (g/bird)	40.00^{b}	50.00^{a}	30.00^{c}	30.00^{c}	3.12	*
Feed conversion ratio	16.04^{b}	13.20^{c}	17.20^{b}	18.23^{a}	3.24	*
Protein efficiency ratio	0.06^{a}	0.04^{b}	0.03^{c}	0.03^{c}		
Mortality (%)	0.00	0.00	0.00	0.00		

abcd:Means with different superscripts along same rows shows significant differences (p>0.05)SEM=standard Error of means, LOS=level of significance,NS=Non significant difference at (p>0.05) * = significant difference at (p>0.05)

value as the inclusion of PSCM increases could be due to the presence of ANF in trace amount which tend to be obvious as the inclusion level increases. However, no mortality was recorded throughout the feeding trial. This goes to buttress the fact that cocoyam is properly processed via parboiling and sun drying it makes pose no adverse effect on the growth and performance of broiler chicken as fed in this study.

Conclusion

It was concluded therefore that parboiled sundried taro cocoyam could replace maize up to 50% on broiler chickens diet without any deleterious effect on performance.

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