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Growth Performance Characteristics of Broiler Chickens Fed Graded Levels of Sundried Cassava (*Manihot esculenta*) Peel Meal Based Diet

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Authors' contributions

This work was carried out in collaboration between both authors. Author ETEE designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author ASE managed the analyses of the study. Author ETEE managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

An eight-week feeding trial was conducted at the Poultry Unit of the Teaching and Research Farm, Ambrose Alli University Ekpoma to evaluate the growth performance of broiler chickens fed varying levels of sun-dried cassava peel meal based diet. A total of one hundred and twenty day-old Anak 2000 broiler chicks were used for this experiment. Forty chicks were randomly selected based on their average initial weights to each of the four treatment diets. (T_1 to T_4) With T_1 serving as the control and T_2 to T_4 having an inclusion level of Sundried cassava peel meal (SDCPM) at 20, 40, and 60% replacement levels for maize respectively in a complete randomized design (CRD). The chicks were brooded and fed for four weeks with commercial starter diet. After that they were fed formulated finisher diets for four weeks. The result of the performance study showed that all the performance parameters assayed in this study were significantly ($P<0.05$) influenced by the treatments diets apart from feed conversion ratio. Final live weight was significantly higher (2.86kg/bird) among birds fed 20% SDCPM. Daily and weekly feed intake were higher (120.00

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g/bird) and (0.80 kg/bird) in birds fed control comparable to those (116.00 g/bird) and (0.78 kg/bird) fed 20% SDCPM. Daily and Weekly weight gain was higher significantly (P<0.05) in birds that ate 20% SDCPM (47.21 g/bird) and (0.37 kg/bird).feed conversion ratio was similar (P>0.05) but least and best value (2.11) was recorded among birds fed 20% SDCPM. The overall result of this study showed that sun-dried cassava peel meal could successfully be included in broiler ration up to 20% level without any adverse effect on the performance of broiler chickens.

Keywords: Broiler chickens; cassava peel; growth performance; sundrying.

1. INTRODUCTION

Broiler production is one of the most popular livestock enterprises adopted by small and medium scale farmers in both rural and urban areas as it offers the highest turnover rate and quicker returns on investment outlay [1,2]. The benefit of broiler production is eroded by the high cost of feed, and it has been well established that feed alone account for about 70% of the total cost of poultry production [3,4]. Maize, which is the predominantly used ingredient for energy in poultry feed in Nigeria, is very costly, because of higher demand for it by humans as food and industrial purposes [5,6]. Therefore, there is an urgent need for an alternative to maize in livestock feeds, to reduce the current pressure on maize as stable food for man [7,8]. With respect to the present trend of rising price of animal feedstuffs all over the world and geometric increase in human population, greater attention has to be paid to the search for safe and cheap local feedstuff including unexplored feedstuff, by-product of agriculture and industry especially in the developing countries where farmers cannot afford the expensive diet for livestock. Nigeria like most other developing countries suffer greatly from a constant shortage of livestock feeds especially those supplying energy. The limitation imposed by scarcity of maize and competition from human consumption has forced many farmers into employing alternative sources of energy for poultry feed formulation. The effort has also been geared towards the utilization of relatively cheaper and available root and tubers in recent years.

Cassava (*Manihot esculenta crantz*) is used in West African Countries as a cheap source of carbohydrate food for man and livestock [9]. The Metabolizable energy value of unpeeled cassava root meal is about (3,870 kcal/kg) which is higher than that of maize (3,430 kcal/kg) [10]. Several researchers have reported their success stories on the use of cassava and its by-products. [11] reported that inclusion of 50% cassava root meal/brewer yeast slurry as a replacement for broiler chicks and is found to reduce the current pressure of maize and price of finished product. Furthermore, [12], reported that starter broilers fed 15% inclusion level of cassava meal/sorghum brewer dried grains increases the live weight and also reduce the cost of feed. However, the low protein content [13] and the dustiness of the feed [14,15] are among the limiting factors in cassava utilization. One of such alternatives for replacement of maize in animal diets is the processed cassava peel meal [16,17]. Cassava peel in Nigeria is always discarded as waste and is usually allowed to rot, hence resulting to waste disposal problem. The relative availability and low cost of cassava peel make it an option in animal feeding [18]. Preliminary findings indicated that processing of cassava peels by soaking possibly reduces more of the cyanide which, could be due to the twin processes of fermentation and leaching of cyanide [19] in the water-soaked peels before sun drying unlike other processing methods [17]. This study is therefore embarked upon to evaluate the growth performance of broiler chickens fed graded levels of sun-dried cassava peel meal basal diet.

2. MATERIALS AND METHODS

2.1 Location and Duration of the Study

The experiment was carried out at the Poultry Unit of the Livestock Teaching and Research Farm, Ambrose Alli University, Ekpoma for eight (8) weeks.

2.2 Sourcing and Processing of Cassava Peel

Fresh cassava (*Manihot esculenta Crantz*) peels were collected from local cassava processing centres or in-house cassava processors in Ekpoma Esan West local government area of Edo state. The cassava peels were soaked in water inside a metal drum for three (3) days, after which they were removed and drained with a basket and sun-dried for five (5) days before

milling to fine particles of 2mm in diameter, using a hammer mill [20]. The resultant product was incorporated into broiler's diets at varying levels stipulated in the study.

2.3 Chemical Analysis

About 40g each of the mealed samples of the processed cassava peel and maize were packed in a tight container to prevent an increase in moisture content and contamination before taken to the laboratory and analyzed for the proximate composition according to the method of [21] as shown in Table 1

Table 1. Analysed proximate composition of sundried Cassava peel and Maize

Parameters	SDCPM	Maize
Moisture	10.03	10.09
Crude protein	4.80	9.80
Crude fibre	16.91	2.70
Ether extract	1.38	2.40
Crude ash	5.52	5.57
NFE	61.36	69.44
Carbohydrate	22.23	43.21
ME (Kcal/kg)	3015.40	3315.45

**Metabolizable energy value was calculated using the method 37x %CP + 81x % EE + 35.5 x % NFE for poultry [24]*

2.4 Management of Experimental Birds and Design

A total of one hundred and twenty (120) day old Anak 2000 broiler chickens were used for the experiment. They were randomly sub-divided into four dietary treatments of three replicates, with ten birds each in a completely randomized design. Feed and water were given to the birds' *ad-libitum.* Lighting source was provided using electricity bulbs during the night. The birds were administered anti-stress and vitamin/mineral premix orally at the recommended dosage after randomization before the commencement of the experiment. The birds were reared on deep litter in an open-sided wire mesh constructed poultry house to allow for adequate ventilation. Medications, vaccinations and other routine management practices were strictly followed. The birds were offered experimental diets and cool, clean water *ad-libitum* throughout the eight weeks period of the experiment.

2.5 Experimental Diets and Treatments

Four experiment diets were formulated to contain cassava peel meal to replace maize at 0, 20, 40 and 60% as T1, T2, T3 and T4 respectively. Treatment 1 was the control diet with no cassava peel meal while diets 2, 3 and 4 contained cassava peel meal at the inclusion level of 20, 40 and 60% respectively. The experimental diets composition is presented in Table 2

2.6 Performance Study

During the feeding trial, the broiler chickens were weighed at the beginning of the experiment (end of 2wks) and subsequently on a weekly basis. Weight changes and feed consumption were recorded weekly, while weight gain, feed intake, feed conversion ratio (FCR) were estimated to assess the growth performance of the birds. Feed intake was calculated as weight of feed offered minus weight of leftover; weight gain was calculated as final weight minus the initial weight and feed conversion ratio (FCR) as feed intake divided by weight gain.

$$\text{Feed conversion ratio} = \frac{\text{Feed intake (g)}}{\text{Weight gain (g)}}$$

2.7 Statistical Analysis

All the data collected were subjected to analysis of variance (ANOVA) and differences between means and treatments were determined using Duncan's multiple range test (DMRT) at 5 percent level of probability. All statistical procedures were according to [22] using [23] package.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Performance characteristics of the broilers fed sun-dried cassava peel meal

The performance characteristics of the experimental broiler chickens as affected by the dietary treatments are depicted in Table 3. The dietary treatment at the finisher phase significantly ($P<0.05$) affected the average Final live weight, average daily feed intake, weekly Feed intake, average daily weight gain and weekly weight gain. However, average initial weight and feed conversion ratio were not significantly ($P>0.05$) affected. Average final live weight was significantly highest among broiler chickens fed 20% Sundried cassava peel meal

(SDCPM) with the mean value of 2.86 kg/bird, followed by similar values of 2.40 kg/bird from those fed the control diet while lowest value of 2.23 kg/bird was recorded from broilers fed diet 4. Average daily and weekly feed intake was higher (P<0.05) among birds fed the control diet with mean values of 120.00 g/bird and 0.80 kg/bird, followed by mean values of 116.00g/bird and 0.78 kg/bird from those placed on 20% (SDCPM) while least mean values of 110.42 g/bird and 0.63 kg/bird was recorded among those maintained on 60% (SDCPM). Average daily and weekly weight gain were higher (P<0.05) among birds fed 20% (SDCPM) with mean values of 47.21 g/bird and 0.37 kg/bird, followed by mean values of 42.02 g/bird and 0.32 kg/bird from those placed on 0% (SDCPM) while least mean values of (26.24 g/bird and 0.27 kg/bird) was recorded among those maintained on 60% (SDCPM) respectively. Feed conversion ratio shows no significant (P>0.05) variation among birds fed the dietary treatments, and no mortality was recorded throughout the feeding trial.

Table 2. Gross composition of experimental broiler finisher diets

	Inclusion levels of SDCPM (%)			
	0	**20**	**40**	**60**
	Diets			
	1	**2**	**3**	**4**
Maize	40.00	30.00	20.00	10.00
SDCPM	0.00	10.00	20.00	30.00
Soya bean meal	25.00	25.00	25.00	25.00
Wheat offal	10.00	10.00	10.00	10.00
Palm kernel meal	18.00	16.00	17.00	16.00
Fish meal	1.00	2.00	3.00	5.00
Oyster shell	1.50	1.50	1.50	1.50
Bone meal	1.00	1.00	1.00	1.00
Salt	0.50	0.50	0.50	0.50
Premix	0.50	0.50	0.50	0.50
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis:				
Crude protein	**21.00**	**21.00**	**21.00**	**21.00**
ME(Kcal/kg)	**2902**	**2895**	**2896**	**2893**

**Metabolizable energy value was calculated using the method 37x %CP + 81x % EE + 35.5 x % NFE for poultry [24]*

Table 3. Performance Characteristics of finishing broilers Fed Dietary Treatments

	Inclusion levels of SDCPM (%)				
	0	**20**	**40**	**60**	
	Diets				
	1	**2**	**3**	**4**	**SEM±**
Ave. Initial body weight (g/birds)	802.67	866.67	827.32	842.13	3.21
Ave. Final live weight (Kg/birds)	2.40^{ab}	2.82^{a}	2.28^{b}	2.23^{b}	0.04
Ave. Daily feed intake (g/birds)	120.00^{a}	116.00^{b}	113.20^{b}	110.42^{c}	2.30
Ave. Weekly feed intake (kg/bird)	0.80^{a}	0.78^{b}	0.69^{b}	0.63^{c}	0.05
Ave. Daily weight gain (g/bird)	42.02^{b}	47.21^{a}	30.13^{c}	26.24^{c}	1.15
Ave. Weekly weight gain (g/bird)	0.32^{b}	0.37^{a}	0.26^{c}	0.27^{c}	0.02
Feed conversion ratio	2.50	2.11	2.56	2.33	0.17
Mortality (%)	0.00	0.00	0.00	0.00	

abc: means in the same row with varying super script differ significantly (P<0.05), SEM±: standard error of mean;SDCPM: Sundried cassava peel meal

3.2 Discussion

The performance characteristics of broiler finisher fed varying levels of sundried cassava peel meal (0, 20, 40 and 60%) revealed a significant (P<0.05) variation in average final live weight, average daily and weekly feed intake, average daily and weekly weight gain, but feed conversion ratio shows otherwise (P>0.05). The increase in the weekly weight gain, feed consumption and the consequent higher final live weight recorded in birds fed 20% sun dried cassava peel meal (SDCPM) may be adduced to the nutrient availability and density which eventually translated to the improvement in growth rate. It also goes to show that the inclusion of sundried cassava peel meal at 20% was efficiently utilized by the birds. This finding agrees with the report of [25] who reported a significant (P<0.05) variation in the weight gain and live weight of broiler chickens fed varying levels of cassava peel meal. It also took credence from the report of [26] who also reported a significant (P<0.05) variation in the weight gain and live weight of cockerels fed graded levels of cassava grit supplemented with moringa. It also lends support from the report of [27] who reported a significant variation in the live weight and weight gain of broiler chickens fed wheat offal fermented with *Aspergillus niger*. Daily and weekly feed intake also differ significantly (P<0.05) with highest mean value recorded in control similar to those on 20% SDCPM and this could be ascribed to the high level of Palatability, and Metabolizable energy in the diet as birds are known to satisfy their energy requirement [28]. The least and best feed conversion ratio recorded among birds fed 20% SDCPM may have been responsible for the better weight gain, and consequent higher live weight of birds maintained on a diet. This observation is in Tandem with that of [29] and [30].

4. CONCLUSION

The overall result of this study showed that sun-dried cassava peel meal could successfully be included in broiler ration up to 20% level without any adverse effect on the performance of broiler chickens.

ETHICAL APPROVAL

As per international standard or university standard, written ethical approval has been collected and preserved by the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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