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Short Communication

Performance and economics of production of finisher broiler chickens fed yellow maize replaced with graded levels of pro-vitamin A cassava meal

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Abstract

Research into the use of alternative energy feedstuff for poultry and livestock production cannot be overemphasized due to the increasing price of conventional energy sources such as maize and guinea corn. One hundred 4-week old broiler chickens were used in a 28-day feeding trial to evaluate the performance and economics of production of finisher broiler chickens fed yellow maize replaced with graded levels of pro-vitamin A cassava meal. The chickens were grouped into four treatments and replicated five times in a completely randomized design. Birds were fed diets containing 0 %, 50 %, 75 % and 100 % of pro-vitamin A cassava meal in replacement for maize tagged T_1, T_2, T_3 and T_4, respectively. All management practices were strictly observed. Birds on T_1 and T_2 (0 and 50%) had statistically higher ($p<0.05$) similar values of weight gain (835.20 and 831.71g) than those from T_3 and T_4 with same statistical values (765.80 and 705.15g). Similar trend was observed in feed intake of 3082.80 and 3130.96g for T_1 and T_2 while T_3 and T_4 had 2919.00 and 2858.80g, respectively. Feed conversion ratio was similar and better in T_1 and T_2 (3.69 and 3.76) which differed significantly ($p<0.05$) with T_3 and T_4 (3.81 and 4.05), respectively. Cost of feed/kg gain significantly reduced with increase in percentage replacement levels of maize with pro-vitamin A cassava. Thus, the replacement of maize with pro-vitamin A cassava at 50% can optimally improve the performance of broiler chickens without adverse effect with reduced cost of production.

INTRODUCTION

Great emphases are continued to be placed on research into the alternative energy feedstuff for poultry and other livestock due to the increasing prices of conventional energy sources such as maize, guinea corn and others (Ogundu *et al.,* 2017). The increased prices of conventional energy sources resulted in high cost of livestock, especially poultry production, shortage in animal protein and hence poor animal protein intake among Nigerians (Ani,

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2007). Consequently, investment into the development of poultry industry is becoming unattractive.

Maize generally had the highest inclusion rate of 400-500kg/MT into poultry feed production as compared to other cereal grains (Eruvbetine *et al.,* 2003). The demand for maize has always exceeded its supply, this results in high cost of the grain and has made it uneconomical to be used as a major source of energy in poultry diets (Ngiki *et al.,* 2014). Therefore, there is need to search for cheaper and readily available feed ingredient that can replace maize in poultry diets.

One of the energy sources that have great potentials in poultry feed is cassava. It is one of the alternative energy sources that can considerably replace proportion of maize in the poultry feed industry. Its products have been in use for a long time in feeding livestock (Bello, 1988), but its use as animal feed is being limited by the presence of toxic cyanogenslinamarin and lotaustralin in its leaves and tubers (Eruvbetine *et al.*, 2003). Research conducted with cassava in terms of its feeding value, nutritional problems encountered, biological responses and productive performances of birds fed cassava products have exhibited wide variability (Eruvbetine *et al.,* 2003). In order to reduce the level of toxic cyanogenic glycoside, increase shelf life and vitamin A content, pro-vitamin A (UMUCASS 36) variety of cassava also called yellow cassava was bred and introduced. This variety is preferred to other existing ones. According to Essien and Sam (2018), the pro-vitamin A cassava (PVAC) is composed of 91.07, 2.30, 4.31, 1.14, 5.01, and 87.24% dry matter, crude protein, crude fiber, crude fat, ash, and nitrogen free extract, respectively. Research work on the potentials of pro-vitamins A cassava has not been fully explored as animal feed stuff. Therefore, the aim of this research was to assess the potentials and cost benefits of replacing yellow maize with pro-vitamin A cassava as a source of energy in the diet of broiler finisher chickens.

MATERIALS AND METHODS

Study Area: The study was carried out in the Poultry Unit of the Department of Animal Husbandry, School of Animal Technology, Akperan Orshi College of Agriculture, **Yandev, Gboko,** Benue State, Nigeria.

Procurement and Processing of Pro-Vitamin A Cassava: The peeled dried pro-Vitamin A (UMUCASS 36) variety of cassava (PVAC) was purchased from Gboko market, Benue State. The dried pro-vitamin A cassava was milled to fine particles of 2mm in diameter to formulate the diets.

Experimental Design and Birds Management: One hundred 4-week old broiler chickens were used for this study. The birds were randomly assigned to four experimental treatments of 25 birds each, with five replicates per treatment in a completely randomized design (CRD). The birds were assigned to four experimental diets: the maize based diet (control diet) while the test ingredients pro-Vitamin A cassava (PVAC) replaced maize at 50%, 75%, and 100% designated as treatments T_1, T_2, T_3 and T_4, respectively as shown in Table 1. Feed and water were given *ad libitum.* Parameters like body weight gain, feed intake, feed conversion ratio, and economics of production were evaluated.

Table 1: Percentage Composition of Experimental Diets for Finisher Birds

Ingredients	T_1 0% (control) (Yellow maize)	T_2 50% (PVAC)	T_3 75% (PVAC)	T_4 100% (PVAC)
Yellow maize	46.60	17.74	9.83	-------
Pro-vit. A cassava	-------	23.30	34.95	46.60
Fullfat soybean	33.40	43.96	40.22	38.40
Rice offal	5.00	10.00	10.00	10.00
Bone meal	4.00	4.00	4.00	4.00
Methionine	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated nutrient				
Protein	19.47	19.23	19.48	19.01
Fiber	3.10	3.61	3.56	3.02
ME (kcal/kg)	2988.41	2934.221	3075.732	3994.78

The birds were reared according to the standard procedure outlined by Dwafwang and Ogundipe (1982). The birds were also given routine medication and vaccination. The experiment lasted for 28 days.

Parameters evaluated

Growth Performance: Data was collected on initial weight of birds, final weight of birds, feed intake and weight gain. The values obtained were used to calculate the following parameters:

I) Feed intake/bird/day(g) = Quantity of feed given (g) - left over (g)

ii) Weight gain/bird(g) = Current live weight (g) - Initial weight (g)

iii) Feed Conversion Ratio (FCR) = Quantity of feed consumed (g) / Weight gain (g)

Economics of production

Feed cost per kg gain was calculated by summing up the cost of each ingredient used in formulating 1kg of feed per treatment in order to determine the cost effectiveness of the various treatment diets.

Statistical Analysis

Data collected on each parameter was subjected to Analysis of Variance (ANOVA) for completely randomized design (CRD) and the significant differences where indicated were separated using Duncan Multiple's Range Test (DMRT) as contained in the Statistical Package for the Social Sciences (SPSS, 2016).

RESULTS AND DISCUSSION

The result of the performance and economics of production of finisher broilers fed graded levels of pro-Vitamin A cassava is as presented in Table 2. The initial weights of the experimental finisher broiler chickens were similar ($P>0.05$). However, T_1 (control) had higher value of

Table 2: **Performance and Production Cost of Broiler Fed Experimental Diets**

Parameter	T_1 (0%)	T_2 (50%)	T_3 (75%)	T_4 (100%)	SEM
Initial body weight (g)	515.20	515.25	515.10	515.15	0.63 NS
Final body weight (g)	1350.40[a]	1346.96[a]	1280.90[b]	1220.30[b]	1.07 *
Weight gain (g)	835.20[a]	831.71[a]	765.80[b]	705.15[b]	1.20 *
Daily weight gain (g)	29.83[a]	29.70[a]	27.35[b]	25.18[b]	1.62 *
Daily feed intake (g)	110.10[a]	111.82[a]	104.25[b]	102.10[b]	2.70 *
Total feed intake (g)	3082.80[a]	3130.96[a]	2919.00[b]	2858.80[b]	1.61 *
Feed Conversion Ratio (FCR)	3.69[c]	3.76[c]	3.81[b]	4.05[a]	0.36*
Cost per kg of diet (?)	112.50	89.20	83.55	74.86	-
Cost of total feed intake/bird (?)	346.82	279.28	243.88	214.01	-
Feed cost/ kg weight gain (? / kg)	93.96	74.19	63.98	52.79	-
Money Saved (?)	-------	19.77	29.98	41.17	-

[a,b]: Means within the same row bearing different superscripts differ significantly (P<0.05)

1350.40g final body weight which was not significantly different (P>0.05) from T_2 (50%) with 1346.96g but differ significantly (P<0.05) from T3 (75%) and T4 (100%) which both had similar statistical (P>0.05) values of final body weights 1280.90g and 1220.30g respectively. The results for weight gain and feed intake followed the same trend where T_1 and T_2 were not significantly different (P>0.05) but differ significantly (P<0.05) from T_3 and T_4 which were also similar (P>0.05). However, numerical differences were observed in all the treatments as feed intake and weight gain decreased with increased levels of pro-vitamin A cassava content in the diets. The decrease in final body weight, daily weight gains and feed intake associated with the increase in percentage replacement levels of pro-vitamin A cassava might be as a result of low density due to bulkiness and dusty nature of cassava meal which tend to reduce intake and weight gain as a result of respiratory tract irritation, as earlier reported (Adedokun *et al.,* 2017; Essien and Sam, 2018). However, the feed intake I this study deviated from the report of Ngiki *et al.* (2014) who observed increase in feed intake of broiler chickens with increase in percentage levels of cassava root – leaf meal mixture at 6.243, 6.607, 6.821, 6.726 and 7.038kg for 0, 25, 50, 75 and 100%, respectively. This disagreement might be attributed to differences in processing methods and mixture of root with leaf meal.

Feed conversion ratio was significantly (P<0.05) different. T_1 with 0% pro-vitamin A cassava had better numerical value (3.69) for feed conversion ratio but not significantly (P>0.05) different from T_2 (50%). Treatments (T_1 and T_2) were significantly different (P<0.05) from T_3 (75%) and T_4 (100%). which was the least (4.05). This agreed with the reported lower feed conversion ratio for broiler chickens fed pro-vitamin A cassava meal by (Akinafala *et al.,* 2011).

The economic analysis revealed that feed cost per kilogram reduced greatly among the treatments as percentage of pro-vitamin A cassava increased. The Control Diet

(0%) recorded the highest cost (? 112.50) while 100% recorded the lowest (? 74.86) per kilogram. Weight gain per cost also followed the same trend. Money saved per kg weight gain were 19.77, 29.98 and ? 41.17 for T_2 (50%), T_3 (75%) and T_4 (100%), respectively. This result is in line with the work of Ngiki *et al.* (2014) on similar cost benefit analysis.

CONCLUSION AND RECOMMENDATIONS

The results presented in this study revealed that feeding broiler birds with pro-vitamin A cassava as a replacement for maize could enhance the growth performance of broiler chickens, which reduced the cost of production and maximizing profit, thereby making broiler chicken meat relatively affordable to consumers. The 50% inclusion levels of pro-vitamin A cassava optimally supported better performance of broiler chickens. Good extension techniques such as training and visit, demonstration farm project and use of mass media should be adopted to increase the production of pro-vitamin A cassava to enhance its availability as alternative source of energy in the diet of broiler finisher chickens.

Conflict of Interest: The authors declared no conflict of interest.

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