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PRELIMINARY INVESTIGATION OF NUTRITIVE POTENTIAL OF *UMUCASS* 36 CASSAVA ROOT MEAL AS SUBSTITUTE FOR MAIZE IN BROILER DIETS

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Abstract

This experiment was carried out to evaluate the nutritive potential of UMUCASS 36 cassava root meal as a substitute for maize in broiler diets. One hundred and fifty (150) one-week old Abor Acre strains of broiler chicks were randomly assigned to 5 dietary treatments in a completely randomized design. They were replicated three times with 10 birds per replicate. The well processed cassava root meal was substituted for maize at 0, 25, 50, 75 and 100% levels and were respectively designated as diets 1, 2, 3, 4 and 5. The birds were fed and watered adlibutum for 49 days. The results show that birds fed diet 2 gave the best ($P < 0.05$) mean total weight gain

(2033.00g), feed-to-gain ratio (2.10), least cost/kg weight gain (#286.47), and best realizable revenue (#2033.00) and gross margin (#286.47). It was also observed that UMUCASS 36 cassava root meal is rich in ether extract (4.10%), crude fibre (6.45%) and ash (7.56%).

In conclusion, though the UMUCASS 36 cassava root meal is deficient in percent crude protein, it is rich in other essential nutrients and has the potential of being used as a dietary energy source in broiler diet. So, substituting maize for UMUCASS 36 cassava root meal at 25% optimized both feed and economic efficiency. It is therefore recommended as a diet of choice whenever high dressed yield and economic efficiency are reasons for broiler production. The other diets can also be used depending on the producer's purpose and capability.

Keywords

Cassava, Maize, Broiler Chicken, Broiler Diet

1. Introduction

The foundation for good health and human development is rooted in the capacity of a nation to adequately provide good quality food in appropriate quantity and at the right time to its own people. The issue of hunger and malnutrition are central in the economic crises that have remained the lots of African countries. Communal and or political clashes, cattle rustling, insurgencies, desert encroachment, lack of fund, unabated population increase and unpredictable climatic conditions are some of the factors militating against adequate supply of animal protein in many of the African countries. It is evident that the rearing of small animals and or poultry which are prolific is now an imperative.

The development of poultry, micro livestock and wildlife are strategic options that we must consider for food security attainment and poverty reduction in our nation and the entire African continent. The need for alternative energy and protein supply feedstuffs has become very important today because of the increasing cost of conventional feed ingredients which has made the poultry products become too exorbitant and unaffordable for majority of the African populace. In order to stem this tide, cheap, easily available unconventional protein and energy resources need be investigated, and where found appropriate, should be used to mitigate the cost of producing animal feed.

According to Iwere (2013), Nigeria is the world leading producer of cassava. Currently, there is an increase in campaign for enlarging the cassava production base in Nigeria. Every part

of cassava is of great value both to man and their animals. The protein content of cassava flour, peels, and leaves is at approximately 3.6%, 5.5% and 21% respectively (Iyayi and Losel, 2001). The protein in cassava has a high arginine content but low methionine, threonine, cysteine, phenylalanine, Isoleucine and proline content (Onwueme, 1978). Cassava contains highly digestible starch. Gomes *et al.* (2005) compared cassava starch to maize starch and found that cassava starch contains 17% amylase and 83% amylopectin when compared with maize and maize starch which has 28% amylase and 72% amylopectin. The comparatively higher amylopectin level means that the digestive starch may be higher in cassava compared with other common starch sources fed to poultry.

It is on this basis that this experiment was carried out to evaluate the effects of feeding pro-vitamin *Umucass* 36 cassava root meal as substitute for maize in Broiler chickens.

2. Materials and Methods

2.1 Test materials

UMUCASS 36 is a variety of *manihot esculenta crantz*, developed by the National Root Crops Research Institute (NRCRI), Umudike; Nigeria. It has a breeder's code of IITA Ms 011368, with a pedigree IITA TMS 1940561 x IITA TMs 1940263 (Harvest Plus, 2015). It is a pro-vitamin cassava with high β carotene content which makes it more preferable to other existing varieties of cassava in Nigeria. *UMUCASS* 36 was presented to the populace for consumption and large scale cultivation in the year 2011.

2.2 Processing of Test Material

The test material was washed, peeled, cut into small chips, oven dried at 70^0C for two days and then milled. The milled flour was packed into polythene bags, ready for use.

2.3 Proximate Composition and Gross Energy Determination of *UMUCASS* 36 cassava root meal and Experimental diets.

Samples of test ingredient and compounded experimental diets were analyzed for proximate constituents according to the methods of AOAC (2000). The gross energy was determined using Adiabatic Bomb Calorimeter.

2.4 Experimental Birds and Management

One hundred and fifty (150) one week old Abor Acre strains of Broiler chicks purchased from a commercial hatchery in Ibadan, Nigeria were randomly assigned to five dietary

treatments (30 Birds/treatment) in a Completely Randomized Design. They were replicated thrice with ten birds per replicate. The adequately processed cassava root meal which served as the test ingredient was used to substitute for maize at 0, 25, 50, 75 and 100% levels and were respectively designated as diets 1, 2, 3, 4 and 5. These birds were fed and watered *adlibitum* for a period of seven weeks (49 days). Standard management procedures were duly followed throughout the period of the trial, which took place at the Poultry Unit of the Teaching and Research Farm of the Michael Okpara University of Agriculture, Umudike, Abia State Nigeria.

2.5 Statistical Analysis

Data were subjected to analysis of variance using SAS (2002) at α 0.05 means were separated using Duncan Multiple Range test of the same software.

3. Results and Discussion

The result of the proximate composition and gross energy determination of *UMUCASS* 36 cassava root meal is presented in Table 1. The result shows that *UMUCASS* 36 cassava root meal is low (2.29%) in crude protein but high in energy (3.66kcal/kg GE), mineral (7.56%) and crude fibre (6.45%) content.

Table 1: *Proximate Composition and Gross Energy of UMUCASS 36 Cassava Root Meal*

Parameter	**Percent**
Dry Matter	91.07
Crude Protein	2.29
Ether Extract	4.10
Crude Fibre	6.45
Ash	7.56
NFE (Nitrogen Free Extract)	70.67
Gross Energy (Kcal/kg)	3.66

The implication of this is that *UMUCASS* 36 cassava root meal is more fibrous than other varieties of cassava (Olugbemi *et al.*, 2010; Ogbamgba and George, 2015 and Natalie and Mingan, 2016) but compared favorably with others in terms of other nutrients. All these could be

due to one or combination of specie difference, time of harvest, type of soil, fertilizer application and the processing methods used.

Table 2 shows the proximate composition and gross energy of *UMUCASS* 36 cassava root meal based diets fed to Broiler Chickens.

Table 2: *Determined Composition and Gross Energy of the Treatment Diets*

Parameters (%)	**Diet 1**	**Diet 2**	**Diet 3**	**Diet 4**	**Diet 5**
Dry matter	90.72	90.81	90.64	90.70	90.63
Crude protein	22.45	21.64	20.83	20.02	19.21
Crude Fibre	3.50	3.54	3.58	3.67	3.71
Ether extract	3.63	3.73	3.68	3.60	3.55
Ash	6.86	7.05	6.95	7.13	7.11
Nitrogen free extract (NFE)	54.28	54.85	55.60	56.28	57.05
Gross energy (Kcal/kg)	4.03	4.02	4.00	4.00	4.00

The result shows there is a numerical decrease in the dietary crude protein content of the diets as the percent cassava root meal substitution for maize increased from 0 to 100 percent. This is simply due to the lower percent crude protein observed in *UMUCASS* 36 cassava root meal compared to that of maize, which is higher. On the other hand, percent crude fibre and Nitrogen free extract numerically increased as the percent cassava root meal substitution for maize increase while percent either extract and ash followed no definite trend. The gross energy of the diets were not depressed because the energy content of both maize and cassava are comparable (Olugbemi *et al.*, 2010).

Table 3: *Growth performance of Broiler Chickens fed UMUCASS 36 cassava root meal as substitute for maize.*

Parameter	**Diet 1**	**Diet 2**	**Diet 3**	**Diet 4**	**Diet 5**	**SEM.**
Initial Weight (g)	179.00	178.00	179.00	179.00	178.00	0.65^{NS}
Final Weight (g)	1990.00^{b}	2210.00^{a}	1860.00^{b}	1653.30^{c}	1413.35^{d}	46.81
Total Weight (g)	1811.00^{b}	2033.00^{a}	1681.00^{b}	1476.00^{c}	1254.67^{d}	46.56
Total Feed Intake (g)	4560.33^{b}	4958.67^{a}	4724.67^{ab}	4124.00^{c}	3779.67^{d}	113.14

Average Feed Intake /Bird/day (g)	93.00[b]	101.19[a]	96.79[ab]	84.46[c]	76.13[d]	2.26
Average Weight gain (g)	36.56[d]	41.49[a]	34.30[b]	33.74[b]	27.62[c]	1.25
Feed Conversion ratio	2.52[ab]	2.10[a]	2.80[b]	2.50[ab]	2.79[b]	0.18
Mortality	10.00[a]	0.00[b]	3.33[b]	0.00[b]	0.00[b]	1.49

- a-d: Means within the same row with different superscript are significantly (P<0.05) different.
- SEM: Standard Error of Mean

All the parameters considered showed significant (P <0.05) differences only with the exception of the initial weight which ranged from 178g to 179g. Birds fed diet 2 had the highest (P<0.05) mean feed intake (4958.67g), which resulted in highest (P<0.05) mean final weight (2210.00g), total weight gain (2033.00g) and best feed conversion ratio (2.10). The result further showed that mean weight gain, feed intake, feed conversion ratio were depressed as the percent *UMUCASS* 36 cassava root meal substitution for maize increased from 0 to 100%. The 10% and 3.33% mortality observed in diets 1 and 3 cannot be adduced to the diets. The result obtained in this trial is in agreement with the findings of Hassan *et al.* (2012) and Ogbamgba and George (2015) which stated that cassava root meal is optimized as substitute for maize at 25% without any adverse effect on the performance of broiler chicken.

Table 4: *Economics of production of Broiler chicken fed graded levels of processed UMUCASS 36 cassava root meal*

Parameter	**Diet 1**	**Diet 2**	**Diet 3**	**Diet 4**	**Diet 5**	**SEM.**
Cost/kg feed (₦)	120.15[a]	117.06[b]	114.48[c]	111.35[a]	109.49[e]	0.01
Cost/feed intake (₦)	547.84[a]	580.82[a]	543.02[a]	461.57[b]	413.91	13.37
Cost/kg weight gain (₦)	302.77[ab]	286.47[b]	323.32[a]	313.87[ab]	332.00[a]	10.09
Production cost (₦)	547.84[a]	580.87[a]	543.02[a]	461.57[b]	413.96[c]	13.37
Revenue realized (₦)	1811.00[b]	2033.00[a]	1681.00[b]	1474.33[c]	1234.67[d]	46.63
Gross Margin (₦)	1263.16[b]	1452.18[a]	1137.98[bc]	19012.76[c]	820.25[d]	43.11

- *a-d -Means within the same row with different superscripts are significantly (P<0.05) different.*

- *SEM - Standard Error of Mean.*

All the economic indices measured showed significant (P<0.05) differences. The control diet (1) which had maize as the major dietary energy source was the costliest (₦120.15). The cost/kg feed decreased with increase (0 to 100%) in the substitutional level of *UMUCASS* 36 cassava root meal for maize. Birds fed diet 2 had the least cost/kg weight gain (₦286.47), and highest production cost (₦580.87), realizable revenue (₦2033.00) and gross margin, an indication that substituting *UMUCASS* 36 cassava root meal for maize at 25% enhanced both economic and productive efficiency of broiler chicken production. From the foregoing, the farmer's profit margin is enhanced, making diet 2 a diet of choice.

4. Conclusion and Recommendation

The test material – *UMUCASS* 36 cassava root meal is deficient in percent crude protein, but rich in other essential nutrients and has the potential of being used as a dietary energy source in Broiler ration. Furthermore, substituting dietary maize with *UMUCASS* 36 Cassava root meal at 25% (Diet 2) gave the highest mean weight gain, and optimized both feed and economic efficiency. It is therefore recommended as a diet of choice whenever high dressed yield and economic efficiency are reasons for broiler production. The other diets (1, 3, 4, and 5) too can also be used depending on the producer's capability.

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