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Performance, Carcass and Organ Weights Characteristics of Finishing Broiler Chickens Fed Pro-Vitamin A (UMUCASS 36) Cassava Meal

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Abstract
A 4-week study was conducted using 120 unsexed Anak strain broilers to determine the performance, carcass and internal organs characteristics of finishing broilers fed unpeeled and peeled fermented pro-vitamin A cassava meal as total replacement for maize. Fresh bio-fortified pro-vitamin A cassava was harvested and divided into two batches. The first batch was peeled and the second batch was unpeeled. Both were soaked separately in a plastic vat containing clean water and allowed to ferment for 72 hours. Thereafter, they were washed with clean water, sundried and milled to produce i. peeled fermented pro-vitamin A cassava tuber meal (PFPC). ii. Unpeeled fermented pro-vitamin A cassava tuber meal (UFPC). The broilers were divided into three groups and fed diets containing 100% maize T_1 (control) as the source of energy, while T_2 and T3 contained 100% unpeeled and peeled fermented pro-vitamin A cassava as the source of energy respectively. Each group was replicated four times with 10 birds per replicate in a completely Randomized Design (CRD). Feed and water were provided ad libitum for the period. Result showed that final body weight, daily weight gain and breast weight of the control were significantly ($p<0.05$) higher than UFPC and PFPC groups. The treatment had no significant ($p>0.05$) effect on the internal organs of the birds. Abdominal fat of the PFPC group was significantly ($p<0.05$) higher than the control and UFPC. The results of this study revealed that unpeeled and peeled fermented pro-vitamin A cassava meal can completely replaced maize in the diets of finishing broilers.
Keywords: Broiler, performance, pro-vitamin A cassava

Introduction

Provision of feed is the most important consideration in poultry enterprise. Feed alone has been reported to account for 60-80% of the total cost of poultry production in developing countries [1, 2] maize contribute 50-55% of the total cost of poultry diets. Limitations imposed by scarcity and high cost of maize due to it consumption by humans has forced many farmers into employing other readily available alternative source of energy such as cassava.

Cassava is one of the alternative energy source that can replace a considerably proportion of maize in livestock feed industry [3]. Its products has been in use for a long time in place of cereal grains for livestock [4] but its use as animal feed is being hampered by the present of toxic cyanogens linamarin and lotaustrulin in it leaves and tubers [5]. 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 [6].

In order to reduce levels of toxic cyanogens, increase shelf-life and vitamin A content in cassava, pro-vitamin A also known as UMUCASS 36 bio-fortified cassava was introduced by plant breeders who conducted series of crosses among selected parents and also evaluate their promising progenies for over 10 years [7].

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 work was to assessed the potentials of pro-vitamin A cassava as a source of energy on the performance; carcass and internal organs of finishing broilers.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the poultry and research unit of the Department of Animal Science, Akwa Ibom State University, Obio Akpa campus. Obio Akpa is located between latitudes $5^{0}17^{1}$N and $5^{0}27^{1}$N and between longitudes $7^{0}27^{1}$N and $7^{0}58^{1}$E with an annual rainfall ranging from 3500mm – 5000mm and average

monthly temperature of 25^0C, and relative humidity between 60-90%. [8].

Source and Processing Method

The fresh pro-vitamin A variety of cassava (UMUCASS 36) tubers were obtained from cross River Basin Authority in Abak Local Government Area, Akwa Ibom State. The tubers were divided into two batches. One batch was peeled and the other was left unpeeled. The peeled and the unpeeled tubers were washed and later soaked in separate plastic Vat containing clean water and allowed to ferment for 72 hours. Thereafter, the fermented tubers were washed, sundried for 3-4 days and run through a hammer mill using 2mm sieve to homogenized it thereby producing; i) unpeeled fermented pro-vitamin A cassava tuber meal (UFPC). ii) Peeled fermented pro-vitamin A cassava tuber meal (PFPC)

Experimental Diets

Three experimental diets T_1, T_2 and T_3 were formulated such that T_1 (control) had maize as source of energy, T_2 and T_3 contained 100% UFPC and PFPC respectively ; completely replacing maize in the diet. Other ingredients were adjusted such that the diet met nutrient requirement of finishing broilers. The ingredients composition of the experimental diets is shown in table 1.

Experimental Birds and Design

One hundred and twenty (120) broiler chickens of mixed sexes (Anak Strain) obtained from a local hatchery were used for the experiment. The broilers were brood for 3 weeks and fed cassava meal free commercial Starter diet. At 35- day of age, the birds were divided into 3 groups of 40 birds each and each group were randomly assigned one of the three experimental diets using completely Randomized Design (CRD). Each group was further replicated 4 times and each replicate of 10 birds were housed in a pen measuring 2m×2m. Wood shavings were used as litter material. Feed and water were provided ad-libitum. All necessary prophylactic medications and vaccinations were also provided. The birds were weighed at the beginning of the experiment and weekly thereafter. Feed intake and mortality were recorded over the period.

Carcass and Internal Organ Evaluation

At day- 63 four birds were randomly selected from each treatment, starved overnight of feed, weighed and sacrificed by cutting their jugular vein. The carcasses were scalded in hot water of about 80ºC for a minute and the feathers were plucked manually. The carcasses were eviscerated by cutting through the vent and the viscera were removed. Weights were obtained for edible carcass parts; drumstick, thigh, shank, back, wings and breast. Weights of internal organs were also determined (gizzard, liver, kidney and heart). The dressed carcasses weights were expressed as percentage of live weight.

Data Analysis

Data generated were subjected to analysis of variance (ANOVA) in a statistical analysis System package [9]. Where ANOVA detected treatment effects, means were compared using Duncan New Multiple Range Test (DNMRT) as outlined by [10].

Results and Discussion

The effect of “unpeeled” and “peeled” fermented pro-vitamin A cassava (UMUCASS 36) on carcass weight, carcass yield, cut-up parts and organ weights of finishing broiler chickens are presented on table 4. The final weight gain and daily weight gain of birds in the control were significantly higher than the UFPC and PFPC groups. The values for final weight gain and daily weight gain of birds in UFPC and PFPC group were comparable. The significant higher ($p>0.05$) weight gain of birds in the control in the present study was similar to reports of [11] who recorded significant higher weight gain value for broiler birds fed maize based diet over the ones fed sundried pro vitamin A cassava meal. However, this result is contrary to the reports of [12] who observed significant higher weight gain values for broilers fed unpeeled fermented gelatinized cassava meal over the ones fed maize based diets.

The feed intakes of the birds in all the treatment were statistically similar although the control was

numerically higher than the UFPC and PFPC group. Relatively low feed intake value recorded by birds in UFPC and PFPC group may be attributed to a higher bulk density due to cassava bulkiness and dustiness. This result is in line with reports of [11, 13] whose birds had similar feed intake values when fed cassava based diet.

In the present study birds in the control had the best feed conversion ratio though not significantly ($p > 0.05$) different from UFPC and PFPC groups. This result does not agree with the submission of [14] who observed a significant ($p<0.05$) lower feed conversion ratio for broiler fed pro vitamin A cassava composite meal.

The live weight, dressed weight and dressing percentages of birds in the control were higher than the UFPC and PFPC groups. The cut-up parts; thigh, drumstick, back, wing and neck were not significantly ($p>0.05$) affected by the diet except breast. The value for breast in the control was significantly ($p<0.05$) higher than the UFPC and PFPC groups.

The dietary treatment had no-significant ($p>0.05$) effect on the internal organs of the birds. The group of PFPC diet developed significantly ($p<0.05$) more abdominal fat than the control and UFPC group. Similar observations had been made by [15, 16].

Cassava has been widely used to replaced maize in the diet for poultry but the results in terms of its feeding value, nutritional problems encountered, biological responses and productive performances of chickens fed cassava products has always exhibited wide variability [6], because of the presence of toxic cyanogenic glycoside but with the introduction of bio-fortified cassava (pro- vitamin A UMUCASS 36) which was used in this study that contain insignificant level of HCN and fermentation method which is regarded as the best method for detoxification of tuberous crops [15] was also use in this study to process the cassava would have help to reduce the effect of HCN toxicity on the birds, however the higher body weight gain recorded by the control over the UFPC and PFPC group could be attributed to the level of protein content of the feed ingredients (maize and cassava). The protein content in maize is higher and of a better quality than cassava. [17] reported that feed quality affects the growth performance of chickens. The liver, kidney, heart and gizzard of the birds were not affected by the diet. There was no observed abnormality on the internal organs. The liver, kidney and heart weights indicated that both UFPC and PFPC diets did not inflict them with toxicity of any type. The non-significant ($p>0.05$) effect of the gizzard showed that the control, UFPC and PFPC diets were finely ground; there were no structural components such as hulls, cereal particles and wood shaving in diets.

Conclusion

The information presented in this study herein; has strongly shown that feeding broiler birds with unpeeled and peeled fermented pro-vitamin A cassava (UMUCASS 36) as a reference diet to maize have shown that it could enhance the growth performance of birds without any depressive effect. It is therefore suggested that pro-vitamin A cassava should be used in poultry diets as total replacement for maize but the diet should be formulated in a way to balance the disparity inherent in crude protein content of cassava and maize respectively.

Recommendation

It is recommended that good extension techniques should be adopted to increase the production of fortified vitamin A cassava in terms of yield per hectare.

Also, in using pro vitamin A cassava as total replacement for maize in broiler diet, the diet should be balanced for protein because of the differences in crude protein content between maize cassava.

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Table 1 Ingredients and Nutrient Composition of Peeled and Unpeeled Fermented Pro-Vitamin A Cassava (UMUCASS 36)

Ingredients	T1(control)	T2 UFPC	T3 PFPC
Maize	60.00	0.00	0.00
Pro-vit A cassava	0.00	55.00	55.00
Blood meal	2.00	4.00	4.00
Fish meal	2.00	4.00	4.00
Soya bean meal	18.00	20.00	20.00
Palm kernel cake	4.00	6.00	6.00
Wheat offal	9.00	8.00	8.00
Bone meal	4.00	4.00	4.00
Common salt	0.25	0.25	0.25
Tm/vit. Premix	0.25	0.25	0.25
L- lysine	0.25	0.25	0.25
L- methionine	0.25	0.25	0.25
total	100	100	100
Calculated chemical	**Composition (%DM)**		
Crude protein	19.18	20.71	19.28
Crude fat	4.03	7.97	6.43
Crude fibre	3.38	4.75	5.74
Ash	3.06	3.88	3.57
NFE	70.35	62.69	64.98

*UFPC- Unpeeled fermented pro-vitamin A cassava meal

*PFPC- Peeled fermented pro-vitamin A cassava meal

To provide the following per kg of feed; vitamin A, 10,000iu; vitamin D3 2000iu; vitamin E, 5iu; vitamin K, 2mg; riboflavin, 4.2mg; vitamin B1, 15mg; vitamin B6, 1.5mg**;** vitamin B12, 0.01mg;Nicotinic acid, 20mg; pantothenic acid, 5mg; folic acid, 0.5mg; biotin, 2mg; choline , 3mg; manganese, 56mg; zinc,5mg, iron, 20mg; copper, 1.0 mg; iodine, 0.8mg; selenium, 2.0mg; cobalt, 1.25mg; Antioxidant, 125mg.

Table 2: Proximate composition of peeled and unpeeled fermented pro-vitamin A Cassava (UMUCASS 36)

Parameter(%)	UFPC	PFPC
Dry Matter %dm	90.05	91.07
Crude Protein %dm	2.56	2.30
Crude Fibre %dm	5.71	4.31
Ether Extract %dm	1.25	1.14
Ash %dm	6.20	5.01
Nitrogen Free Extract %dm	84.28	87.24

*UFPC- Unpeeled fermented pro-vitamin A cassava meal

*PFPC- Peeled fermented pro-vitamin A cassava meal

Table3: Performance of finishing broiler chickens fed Unpeeled and Peeled fermented Pro-vitamin A Cassava

Parameter	T_1control	T_2 UFPC	T_3 PFPC	SEM
Initial body weight (g)	1130.11	1112.02	1115.14	0.01
Final body weight (g)	2630.10	2397.07	2405.31	0.12
Weight gain (g)	1499.90	1289.05	1290.17	28.02
Daily Weight gain (g)	53.57	46.04	46.08	1.44
Feed intake g/day	140.01	130.45	133.01	6.42
Feed conversion ratio (gfeed/ggain)	2.61	2.83	2.89	0.12
Mortality	0.00	0.00	0.00	0.00

Table 4: Carcass, Cut-up parts and Internal Organs Evaluation of finishing broiler Chicken

Parameter	T_1control	T_2 UFPC	T_3 PFPC	SEM
Live weight (kg)	2.53[a]	2.37[b]	2.39[b]	1.12
Dressed weight (kg)	1.61 [a]	1.46[b]	1.49[b]	0.03
Dressing percentage (%)	63.63[a]	61.09[b]	62.34[b]	1.16
Abdominal fat (%)	1.58	2.31	2.51	0.17
Relative cut-up parts (% of LW)				
Breast	31.88[a]	29.86[b]	29.78[b]	0.15
Thigh	24.13	23.57	23.71	1.03
Drumstick	19.65	19.21	19.34	0.13
Back	22.57	22.32	21.87	0.15
Wing	12.50	12.41	12.39	0.06
Neck	6.97	6.54	6.71	1.08
Relative organ weight (%of LW)				
Liver	2.53	2.37	2.39	0.13
Gizzard	2.64	2.71	2.78	0.17
Heart	0.50	0.56	0.56	0.19
Kidney	0.25	0.20	0.24	0.01

ab – means within rows with different superscripts are significantly ($p<0.05$) different