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EFFECTS OF CASSAVA AND YAM PEEL MEALS ON CARCASS TRAITS AND ECONOMICS OF PRODUCTION OF FINISHING BROILERS

EFECTOS DE LAS COMIDAS DE CASSAVA Y YAM PEELS EN LAS CARACTERÍSTICAS DE CARCASS Y LA ECONOMÍA DE LA PRODUCCIÓN DE ASADORES DE ACABADO

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ABSTRACT

A four week study was conducted using 180 four weeks-old Abor acre broilers to determine the carcass traits and economics of production of finishing broilers fed cassava and yam peel meals as partial replacement for maize. They were randomly assigned to three treatment groups of 60 birds each. Each treatment group was replicated three times with twenty birds constituting a replicate. The three treatment groups were fed the three experimental diets in a completely randomized design (CRD) for 28 days. Feed and water were provided *ad libitum* for the period. Proximate composition results revealed that cassava and yam peel meals are rich in energy and minerals. Birds on diets T_1 and T_3 had similar ($p > 0.05$) final live and de-feathered weights, which were higher ($p<0.05$) than those on diet T_2. Birds on diet T_2 and T_3 had the lower ($p < 0.05$) carcass weight than the birds on diet T_1. There were no significant ($p > 0.05$) differences in the cut parts and organ weights, but there were significant differences in the dressing percentage of the birds across the treatments. Revenue generated per bird was influenced ($p < 0.05$) with T_3 birds having better income. It was concluded that sun-dried yam peel meal can replace 20 percent maize in the finishing broiler diet without adverse effects on performance and at reduced cost of production

Keywords: poultry, agro waste, unconventional feedstuffs, production traits, roots and tubers.

RESUMEN

Se realizó un estudio de cuatro semanas utilizando 180 pollos de engorde Abor acre de cuatro semanas para determinar los rasgos de la canal y la economía de la producción de pollos de engorde alimentados con harina de yuca y cáscara de ñame como reemplazo parcial del

maíz. Fueron asignados aleatoriamente a tres grupos de tratamiento de 60 aves cada uno. Cada grupo de tratamiento se repitió tres veces con veinte pájaros que constituyen una réplica. Los tres grupos de tratamiento fueron alimentados con las tres dietas experimentales en un diseño completamente al azar (CRD) durante 28 días. Se proporcionaron alimento y agua ad libitum para el período. Los resultados inmediatos de la composición revelaron que las comidas de yuca y cáscara de ñame son ricas en energía y minerales. Las aves en las dietas T1 y T3 tuvieron pesos finales vivos y sin plumas similares ($p > 0.05$), que fueron más altos ($p < 0.05$) que los de la dieta T2. Las aves en la dieta T2 y T3 tuvieron el menor peso en canal ($p < 0.05$) que las aves en la dieta T1. No hubo diferencias significativas ($p > 0.05$) en las partes cortadas y el peso de los órganos, pero hubo diferencias significativas en el porcentaje de vendaje de las aves en los tratamientos. Los ingresos generados por ave fueron influenciados ($p < 0.05$) con las aves T3 con mejores ingresos. Se concluyó que la harina de cáscara de ñame secada al sol puede reemplazar el 20 por ciento de maíz en la dieta de engorde final sin efectos adversos en el rendimiento y con un costo de producción reducido

Palabras clave: aves de corral, residuos agrícolas, piensos no convencionales, rasgos de producción, raíces y tubérculos.

INTRODUCTION

In developing countries like Nigeria, the consumption of poultry products (chicken and egg) are considered as luxury by a large number (Jiwuba *et al*., 2018a) of people. This is greatly due to high cost of poultry meat and eggs, which is controlled by the high cost of conventional feedstuffs. This problem of high cost of conventional feed ingredients has called for an urgent search for cheap and readily available local feedstuffs (Jiwuba *et al*., 2018a) such as tropical agricultural waste among poultry researchers. However, the diets should be formulated at a cheaper rate and at the same time supply the required nutrients without altering the physiological status of the birds (Jiwuba and Onunwa, 2018).

Large number of agro-by product feedstuffs with enormous potentials exist in Nigeria Ologhobo (1992), amongst them are cassava peel and yam peel. These agro-based by products are sources of energy but also have their limitations. The feeding values of these agro-byproducts are well documented (Ojewola and Long, 1999). Cassava peel and yam peel has inestimable value in livestock and poultry feeding because of their reported (Jiwuba *et al*., 2016a; Ezieshi and Olomu, 2011) energy values and mineral contents. Yam peels are wastes or by- product of processing when the tubers are being processed. Yam peel meal can be sourced in substantial quantities from household kitchens, commercial eateries and markets but, information on the chemical composition and effects on broiler nutrition is scanty. Its availability in Nigeria was 1,000 tonnes in 1993 and 1,700 tonnes in 2000 (Presidential Task Force on Alternative Formulation of Livestock Feed, 1992). Importance is currently placed on the expanded programme of yam cultivation; many high yielding and disease resistant varieties

through the improvement effort of IITA and National Root Crop Research Institute, Umudike; this thus will enhance the availability of the peels. Study with yam peel meal (YPM) (Akinmutimi and Onen, 2008) revealed that it can replace up to 15% of the maize in broiler chicken diets without adverse effects on performance and at reduced cost of production. Cassava peel has been extensively exploited in ruminant feeding. Its use in poultry has been limited due to the low protein content (Salcedo *et al*., 2010), high cyanide content (Ubalua and Ezeronye, 2008; Morgan and Choct, 2016), high fibre and moisture contents (Jiwuba *et al*., 2018b). Cassava can be harvested to produce garri, fufu, tapioca, abacha, chips, starch, flour etc which are all in high demand in Nigeria (Jiwuba *et al*., 2018b). These numerous uses of cassava has led to its high demand for different human or industrial uses thereby enhancing the availability of the peel which are grossly underutilized and are hitherto discarded as waste. These by-products are abundant and can be easily sourced at no cost. This study was therefore carried out to compare the performance of finishing broiler fed cassava peel meal (CPM) and yam peel (YPM).

MATERIALS AND METHODS

The study was conducted at the Poultry Unit of the Teaching and Research Farm, Federal College of Agriculture, Ishiagu, Ebonyi State, Nigeria. The College is located at about three kilometers (3 km) away from Ishiagu main town. The College is situated at latitude 5.56°N and longitude 7.31°E, with an average rainfall of 1653 mm and a prevailing temperature condition of 28.50°C and relative humidity of about 80% (Jiwuba *et al*., 2018a).

Fresh cassava and yam peels were collected from the Root and Tuber Processing Unit of the Federal College of Agriculture, Ishiagu, and its environs. The peels were subsequently sun dried to about 10% moisture content before milling with 2mm hammer mill and used in the formulation of the experimental diets.

A total of 180, four weeks old Abor acre broilers were used for this study. They were randomly assigned to three treatment groups of 60 birds each. Each treatment group was replicated three times with twenty birds constituting a replicate. The three treatment groups were fed the three experimental diets (Table 1) in a completely randomized design for 28 days. Each replicate was housed in a concrete floor covered with wood shavings as the litter material. The birds were stabilized for 7 days before the commencement of the study in line with the permission and guidelines of research policy of the College's Animal Ethics Committee. Before the arrival of the 4 week-old chicks, the brooding house was swept, washed, disinfected, and allowed to dry. Feed and water were provided *ad libitum*.

At the end of the experiments, 2 birds per replicate were randomly selected, starved 0f feed for 12 h, and slaughtered for de-feathered, carcass, and organ weight determinations. Carcass weight was calculated by removing the head, lower shank bones, and internal organs from the de-feathered weight. Dressing percentage was calculated as the percentage of the

carcass weight to the final live weight. The internal organ weight and weight of the cut parts were expressed as percentage of carcass weight.

The prevailing market prices of the feed ingredients at the time of the experiment were used to estimate the unit cost of the experimental diet (N360 = $1 at the time of the experiment). The variable costs of feeding the birds considered the cost of the feeds and all other costs (i.e., labour, capital investment, and housing) were the same for all the treatments. The costs of processing the cassava and yam meals were included as the feed cost.

Proximate analysis of different of the test ingredients were carried out at the College of Animal Science and Animal Production, Michael Okpara University of Agriculture, Umudike, Animal Nutrition Laboratory, using the methods of AOAC (2000). The results were analyzed with the general linear model (GLM) procedures of Special Package for Social Sciences (SPSS 17.0).

RESULTS AND DISCUSSION

The proximate composition of the sun-dried cassava and yam peel meals used in this study is presented Table 2. The proximate composition of cassava peel revealed high dry matter (DM) of 87.90% which is compared with 90.28% reported by Jiwuba *et al*. (2016a). The crude protein (CP) content in the present study is highly comparable with 5.49% reported by Oloruntola *et al.* (2016). The proximate composition for the cassava peel meal is in agreement with the reported values of Oloruntola *et al.* (2016), Jiwuba *et al*. (2016a) and Guimarães et al. (2014). The proximate composition of the YPM is comparable with the reported values of Ezieshi and Olomu (2011).

Table 1. Percentage composition of experimental diets.

Ingredient	T_1	T_2	T_3
Maize	60.50	40.50	40.50
Cassava peel meal	0.00	20.00	0.00
Yam peel meal	0.00	0.00	20.00
Soybean meal	30.20	30.20	30.20
Palm oil	2.00	2.00	2.00
Fish meal	4.00	4.00	4.00
Bone meal	2.50	2.50	2.50
Common salt	0.25	0.25	0.25
Methionine	0.10	0.10	0.10
Lysine	0.20	0.20	0.20
Premix *	0.25	0.25	0.25
Total	100	100	100
Calculated Analysis			
Crude Protein (%)	21.33	20.37	21.63
Metabolizable Energy (Kcal/kg)	3173.37	3075.97	3007.57

*supplied per kg of diet: 5,000iu Vit A; 100,00iu Vit D_3; 800mg vit E, 400mg vit K; 1,200mg vit B_2; 1,000mg Vit B_3; 4mg vit B_{12}; 3,00mg; Niacin; 4,00mg vit. C; 11200mg chlorine; 24000mg Mn; 8,000mg Fe 1,600mg Cu; 18,000mg Zn; 500mg iodine; 48mg selenium; antioxidant (BHT).

Table 2. Proximate composition of sun-dried cassava and yam peels

Nutrient	Cassava Peel	Yam peel
Dry Matter (DM)	87.90	89.74
Crude Protein (CP)	5.12	10.21
Crude Fibre (CF)	12.09	6.40
Ether Extract (EE)	1.19	1.34
Ash	6.01	5.22
Nitrogen-Free Extract (NFE)	68.93	70.55

The results of the carcass characteristics of finishing broilers fed cassava and yam peel based diets are presented in Table 3. Birds in T_1 and T_3 produced similar ($p > 0.05$) live weight and de-feathered weight, which differed significantly ($p<0.05$) from those in T_2. Birds on diet T_2 and T_3 had significantly ($p < 0.05$) lower carcass weight compared to birds on T_1 diet. The dressing percentage differed significantly ($p<0.05$) across the treatment groups. There was no significant effect ($p < 0.05$) of cassava and yam peel based diets on breast muscle weight, back cut weight, thigh muscle weight and drumstick weight. The significant differences observed in the de-feathered weights and carcass weights in this present study is in agreement with the earlier results of Jiwuba *et al*. (2018a) in broilers fed Siam weed leaf meal. The carcass weight ranged from 1297.49 –1583.00 g and this is in tandem with earlier results of Jiwuba *et al*. (2016b) on broilers fed sweet potato root meals. The significant poor carcass weight of broilers on T_2 could be attributed to the impaired nutrient utilization. This maybe further attributed to the higher concentration of linamarin content in cassava peel meal. This cyanogenic glucoside releases toxic cyanide (HCN) during hydrolysis at the time of digestion, which may impair nutrient digestion and absorption. Also the higher crude fibre revealed in the proximate analysis could also limit nutrient utilization sin the respective treatment group. The dressing percentage (54.41 – 61. 69%) reported in this study is lower than the reported range (78.61- 83.37%) by Jiwuba *et al*. (2016c) for broilers fed aerial yam tuber meal. The significant lower dressing percent observed in this study is in agreement with the earlier findings of Jiwuba *et al*. (2016b) who fed sweet potato root meal to broilers. The weights of the meat cuts and the internal organs showed no significant ($p>0.05$) difference across the groups. The non-significant difference reported for the organs were an indication that the physiological and anatomical functions of these organs were not influenced by the experimental diets. This further indicated that the cassava and yam peel meals may not have anti-nutritive factors at the levels that may hamper the normal physiological and anatomical functions of the organs of the broilers.

The economics of production of finishing broilers fed cassava and yam peel meals are presented in Table 4. Cost of production per kilogram of feed differed ($p<0.05$) among the treatment groups, with T_1 showing significantly ($p<0.05$) higher cost than T_2 and T_3. The significantly lower cost/kg feed may be attributed to the inclusion of the cassava and yam peel meals in the respective treatment diets. This is in agreement with the earlier report of Jiwuba *et al*. (2018a) who reported low cost/kg feed due to the addition of locally available alternative feedstuff. The values for feed cost per daily weight gain were lowest for the broilers fed T_3 diet (N187.67); however, this unit cost differed ($p < 0.05$) significantly from the values recorded on broilers fed diets T_1 and T_2. Revenue generated per bird showed significant ($p < 0.05$) differences with birds on diet T_3 having the best income. This result was in agreement with the results of earlier studies by Ogundipe *et al*. (2003). The result demonstrated the qualitative benefits and financial returns of using YPM diet.

Table 3. Carcass traits of finishing broiler birds fed cassava and yam peel based diets

Parameters	T_1	T_2	T_3	SEM
Live weight (g)	2566.17[a]	2384.60[b]	2577.40[a]	112.64
De-feathered weight (g)	2143.97[a]	1717.63[b]	2053.51[a]	53.11
Carcass weight (g)	1583.00[a]	1297.49[b]	1500.75[b]	47.65
Dressing percentage	61.69[a]	54.41[c]	58.23[b]	2.25
Breast cut (%)	33.09	33.02	33.16	1.41
Back cut (%)	24.11	23.46	23.88	0.78
Thigh (%)	16.66	15.87	16.76	0.69
Drumstick (%)	16.70	15.75	16.86	0.70
Organs				
Kidney (%)	0.42	0.79	0.65	0.16
Heart (%)	0.31	0.33	0.32	0.03
Spleen (%)	0.10	0.10	0.10	0.10
Liver + gall bladder (%)	1.62	1.94	1.68	0.12
Lungs (%)	0.56	0.55	0.57	0.03

Means within the same row with different superscript letters are significantly different ($p < 0.05$)

Table 4. Economic of production of finishing broiler birds fed sun-dried cassava and yam peel based diets

Parameters	T_1	T_2	T_3	SEM
Cost/kg feed (₦/kg)	130.51[a]	80.20[b]	80.20[b]	1.46
Total feed intake (kg)	3.55	3.98	3.58	0.35
Total cost of feed consumed/bird (₦)	463.31[a]	319.20[b]	287.12[c]	2.50
Daily feed cost (₦)	16.55[a]	11.40[b]	10.25[c]	0.03
Feed cost/kg weight gain (₦/bird)	305.39[a]	239.00[b]	187.67[c]	7.63
Revenue generated per bird (₦)	1702.69[b]	1665.40[c]	1890.28[a]	22.31

Means within the same row with different superscript letters are significantly different ($p < 0.05$)

As conclusion, the results indicated that sun-dried yam peel meal can be better utilized by finishing broilers than cassava peel meal. The inability of the cassava peel to support carcass traits and economics production of finisher broiler could be attributed to higher HCN and fibre contents. Finally, sun-dried yam peel meal can replace 20 percent maize in the finishing broiler diet without adverse effect on performance and at low cost of production.

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