GROWTH RESPONSE AND BLOOD PROFILE OF BROILER FINISHER FED VARYING LEVELS OF HIGH QUALITY CASSAVA PEELS AS REPLACEMENT FOR MAIZE

AKINSUYI M. A.*, OYENIYI F. G. and AJAYI F. E.
Department of Agricultural Technology, Ekiti State Polytechnic, Isan Ekiti,.
**Email: akinmoseakin@gmail.com*

ABSTRACT
This study investigated the blood indices and growth performance of broiler finisher birds fed 0%, 25%, 50%, 75% and 100% High Quality Cassava Peels (HQCP) as replacement for maize. One hundred and fifty unsexed three week-old Abor Acre broiler chicks were randomly distributed to five treatment groups in a completely randomized design. Each treatment group was replicated three times with 10 birds per replicate. . The dietary treatments: T1, T2, T3, T4 and T5 represented 0%, 25%, 50%, 75% and 100% of HQCP replacement levels respectively. The study lasted for 21 days. Performance indices were measured. . Blood samples were collected for haematological assay. The final body weight, daily weight gain, daily feed intake, FCR and feed cost/kg were significantly ($p<0.05$) influenced by the dietary treatments. Mortality was not affected by HQCP levels of inclusion in the diets. The cost of production of feed per/kg reduced significantly with increasing levels of HQCP in the diets. There was significant ($p<0.05$) effect of HQCP inclusion in diets on all haematological parameters except on the lymphocyte concentration. It was concluded that HQCP could replace 50% maize in broiler finisher diets without deleterious effect on growth performance and health status of broiler finisher birds.
Keywords: broiler finisher, high quality cassava peel, blood, growth, maize

INTRODUCTION

Maize is the most commonly used conventional feed ingredient as energy source for poultry feeding worldwide because of it high metabolisable energy (Bhuiyan *et al.,* 2013). However, maize is expensive in the tropics as they are also in high demand for human consumption, and may be used for biofuel production (Morgan and Choct, 2016).

Poultry scientists are now faced with the option of sourcing for non-conventional ingredients to replace the costly energy source such as maize. Several studies have suggested the use of cassava as a replacement for maize as an energy source in poultry diets because it is produced in great quantities and has high energy content; 3000-32000 kcal/kg (Buitrago e*t al*., 2002), 3279 kcal/kg (Olugbemi *et al*., 2010) and 3519 kcal/kg (Broch *et al.,* 2017). Omede *et al.* (2018) suggested that well-processed cassava can potentially be used to replace up to 50% of maize in poultry diets without causing adverse effects on health and performance of the birds. High Quality Cassava Peel (HQCP) was reported to have been used to replace maize up to 30% level. Cassava peel meal is reported to contain between 3.1-5% crude protein and 9-12% crude fibre, respectively (Babatunde, 2013). Cassava peel is high in fibre and low in energy and protein (Ngiki *et al.*, 2014). The protein content of cassava peel meal (30–60 g/kg) is lower than that of most cereal grains (Adesehinwa *et al.*, 2011). Abu *et al.*, 2015 reported that 20% cassava peels as replacement for maize could be used in broiler finisher diets without any deleterious effect on growth of broiler chicken.

This study therefore, was conducted to determine the extent to which high quality cassava peel could be used as replacement for maize in broiler chicken diets.

MATERIALS AND METHODS

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm of Ekiti State Polytechnic, Isan Ekiti. One hundred and fifty three-week-old Abor Acre broiler chicks were randomly assigned to five different diets in a completely randomized design. . Each treatment diet was replicated thrice with ten (10) birds per replicate. Diets used were produced at the Teaching and Research Farm Feed Mill of Ekiti State Polytechnic and were free of feed additives. The study lasted twenty one (21) days.

Table 1: Gross composition of the Experimental diets of broilers finisher fed High Quality Cassava Peels

	% INCLUSION LEVELS				
Ingredients	Diet 1 (0% HQCP)	Diet 2 (25% HQCP)	Diet 3 (50% HQCP)	Diet 4, (75% HQCP)	Diet 5 (100% HQCP)
Maize	68.00	51.00	34.00	17.00	0.00
HQCP	0.00	17.00	34.00	51.00	68.00
Soy Bean Meal	22.00	22.00	22.00	22.00	22.00
Wheat offal	4.19	4.19	4.19	4.19	4.19
Bone meal	2.20	2.20	2.20	2.20	2.20
Fish meal	3.00	3.00	3.00	3.00	3.00
Broiler premix	0.01	0.01	0.01	0.01	0.01
Table salt	0.50	0.50	0.50	0.50	0.50
Methionine	0.05	0.05	0.05	0.05	0.05
Lysine	0.05	0.05	0.05	0.05	0.05
Calculated nutrient values					
Crude protein (%)	21.15	20.05	20.01	19.98	19.94
ME (kcal/kg)	2981.62	3020.72	3059.82	3098.92	3138.02
Lysine	0.97	0.93	0.89	0.85	0.82
Methionine	0.39	0.36	0.32	0.29	0.26
Ether extract	3.13	2.51	1.90	1.29	0.68
Crude fibre	3.24	2.89	2.53	2.17	1.82
Calcium	1.05	1.04	1.04	1.03	1.02
Phosphorus	0.62	0.62	0.61	0.61	0.60

Note – ME- Metabolisable energy, HQCP – High Quality Cassava Peel

The HQCP was purchased from International Livestock Research Institute (ILRI), Ibadan. Clean drinking water and feed were provided *ad libitum.* The daily weight gain, daily feed intake and feed conversion ratio (FCR) were calculated. The proximate composition of the experimental diets was carried out as described by AOAC (2002). The proximate composition of the experimental diets is presented in Table 2. Blood samples for haematological indices were obtained from two birds per treatment at the end of the trial. Blood was collected via wing vein using hypodermic needle and syringe into bottles containing EDTA (ethylene diamine tetra acetic acid). Blood was analysed for haemoglobin (Hb), packed cell volume (PCV), RBC, and white blood cells (WBC) counts and its differentials. The PCV was measured by a microhaematocrit capillary tube using a Haemocrit reader. Erythrocyte concentration (EC), haemoglobin (Hb) and leucocytes concentration (LC) and WBC counts were measured using an automated cell counter within 24 hours after collection of blood.
Data were subjected to Analysis of Variance (ANOVA) using the General Linear Model of SAS (2008) package for windows. Significant differences between means were separated using the Duncan Multiple's Range Test.

RESULTS AND DISCUSSION

The proximate composition of the experimental diets is shown in Table 2. The analysed chemical composition of the experimental diets were in agreement with the calculated values.

Table 2: Proximate Composition of the Experimental diets of broilers finisher fed High Quality Cassava Peels

PARAMETERS	% INCLUSION LEVELS				
	Diet 1 (0% HQCP)	Diet 2 (25% HQCP)	Diet 3 (50% HQCP)	Diet 4, (75% HQCP)	Diet 5 (100% HQCP)
Moisture (%)	11.47	10.75	9.88	8.85	7.52
Dry Matter (%)	88.53	89.25	90.12	91.15	92.48
Crude Protein (%)	20.12	20.2	20.01	19.92	19.58
Crude Fibre (%)	5.85	5.55	5.32	6.1	7.28
Ether Extract (%)	4.89	4.01	3.94	2.69	2.43
ASH (%)	4.91	5.41	5.12	5.21	5.84
NFE (%)	52.76	54.08	55.73	57.23	57.35

ME	3013.51	2992.05	3037.93	2986.60	2957.22

NFE – Nitrogen free extract, ME – Metabolisable energy

Performance characteristics of broiler finisher fed varying replacement levels of High Quality cassava Peels is shown in Table 3.

Table 1: Growth Performance Characteristics of Broiler Chicken fed varying inclusion levels of High Quality Cassava Peel

PARAMETERS	% INCLUSION LEVELS						
	Diet 1 (0% HQCP)	Diet 2 (25% HQCP)	Diet 3 (50% HQCP)	Diet 4, (75% HQCP)	Diet 5 (100% HQCP)	SEM	p-value
Initial body wt (g/bird)	918.65	801.29	652.29	714.67	701.46	44.34	0.3794
Final body wt (g/bird)	2557.77^{a}	2338.79^{ab}	2234.97^{b}	1786.98^{c}	1516.33^{d}	106.12	<.0001
Daily wt gain (g/bird)	78.05^{a}	73.21^{a}	75.37^{a}	51.06^{b}	38.80^{b}	4.60	0.0010
Daily Feed Intake (g/bird)	120.19^{a}	86.74^{b}	88.65^{b}	82.09^{b}	91.43^{b}	4.55	0.0285
FCR	1.56^{b}	1.19^{b}	1.18^{b}	1.64^{b}	2.40^{a}	0.14	0.0084
Mortality (%)	5.00	3.33	1.67	1.67	3.33	0.65	0.8254
Fc/kg feed (₦)	368.18^{a}	346.05^{b}	323.92^{c}	301.80^{d}	279.68^{e}	8.36	0.0001

HQCP – High Quality Cassava Peel, FCR – Feed Conversion Ratio, Fc- Feed Cost, SEM: Standard Error of Mean

The final body weight, daily weight gain, daily feed intake, FCR and feed cost/kg was significantly ($p<0.05$) affected by replacing maize with HQCP in the diet. The final body weight was higher ($p<0.05$) on the control diet (0% HQCP). Performance characteristics were significantly similar on 25% HQCP and 50% HQCP. Daily weight gain was similar and higher ($p<0.05$) on 0% HQCP, 25% HQCP and 50% HQCP than on 75% HQCP and 100% HQCP with similar values. There was no significant difference ($p<0.05$) observed in the daily weight gain of birds fed diets 75% HQCP and 100% HQCP inclusion levels. Daily feed intake was significantly higher on 0% HQCP than on other treatments. The least feed conversion ratio was recorded in birds on diets 1, 2, 3 and 4 but significantly higher in birds on 100% HQCP inclusion level. The statistically similar final body

Table 4: Haematological parameters of broiler finisher birds fed varying dietary inclusion levels of high quality cassava peels

PARAMETERS	% INCLUSION LEVELS					SEM	p-value
	Diet 1 (0% HQCP)	Diet 2 (25% HQCP)	Diet 3 (50% HQCP)	Diet 4, (75% HQCP)	Diet 5 (100% HQCP)		
PCV (%)	39.62^{a}	31.93^{b}	32.77^{b}	40.00^{a}	32.14^{b}	1.26	0.0008
Hb (g/dL)	13.25^{a}	10.68^{b}	10.96^{b}	13.38^{a}	10.75^{b}	0.44	0.0144
RBC (x10^{6}/uL)	2.42^{a}	1.31^{b}	2.05^{ab}	1.14^{b}	1.63^{ab}	0.18	0.0816
WBC (uL)	11122.00^{a}	4482.00^{d}	4370.00^{e}	10105.00^{b}	7444.00^{c}	928.72	<.0001
Lymphocyte (%)	29.90	30.00	32.53	31.25	30.21	0.4078	0.1697
Monocytes (%)	12.37^{d}	12.50^{d}	15.66^{b}	13.75^{c}	16.67^{a}	0.5769	0.0002
Heterophils (%)	51.25^{b}	55.00^{a}	44.58^{c}	51.25^{b}	48.96^{b}	1.1598	0.0022
Basophils (%)	2.06^{a}	0.00^{b}	2.41^{a}	1.25^{a}	2.08^{a}	0.3108	0.0197
Eosinophils (%)	5.16^{a}	2.50^{b}	4.82^{a}	2.50^{b}	2.08^{b}	0.4422	0.0011

PCV- Packed Cell Volume, Hb – Haemoglobin, RBC – Red Blood Cell, WBC – White Blood Cell, SEM: Standard Error of Mean

weight and daily weight gain on 25% HQCP and 50% HQCP with the lowest FCR (1.18) on diets 3 (50% HQCP) replacement level suggested that HQCP could replace 50% maize in broiler finisher

diets. This agrees with the findings of Omede *et al.* (2018) that well-processed cassava can potentially be used to replace up to 50% of maize in poultry diets without causing adverse effects on health and performance of the birds. Mortality were not significantly influenced by the dietary treatments. The cost of feed production per/kg reduced significantly with increasing levels of HQCP in the diets.

The haematological parameters of broiler finisher birds fed varying dietary inclusion levels of high quality cassava peels is shown in table 4. The dietary treatment significantly ($p<0.05$) influenced the PCV, Hb and RBC. The PCV, Hb and RBC were not significantly ($p<0.05$) different at the 25% HQCP and 50% HQCP inclusion level. The RBC (10^6/uL) was significantly ($p<0.05$) higher on 0% HQCP level than on the 25% and 75% HQCP level but was not different statistically from those on 50% and 100% HQCP levels. The PCV (31.93-40.00 %) and Hb (10.68-13.38 g/dL) recorded in this study was within PCV (35.9-41.0 %), Hb (11.60-13.68g/dl) range reported for broiler chickens, while the RBC (1.14-2.42 10^6/uL) were lower than RBC (4.21-4.84 x $10^{6/}$mL (Campbell, 2013).There was significant ($p<0.05$) effect of diets on the WBC and WBC differentials except the lymphocytes. Monocytes was significantly ($p<0.05$) higher on 100% replacement of HQCP but was not different on 0% HQCP and 25% HQCP replacement level. Monocytes (12.37-16.67 %) in this study was within the 16 % reported for broiler by Sebastian *et al*. (2012) and higher than (2.00-3.67%) reported for broiler by Asaniyan and Akinduro (2020). Heterophils was higher ($p<0.05$) on 25% HQCP replacement level than on all other treatments with the lowest value on 50% HQCP level but does not differ across 0% HQCP, 75% HQCP and 100% HQCP inclusion levels. Basophils (%) was lower ($p<0.05$) on 25% HQCP replacement level and were not different ($p<0.05$) across 0% HQCP, 50% HQCP, 75% HQCP and 100% HQCP inclusion levels. Eosinophils (%) were significantly ($p<0.05$) higher on 0% HQCP and 50% HQCP replacement value but were not different ($p<0.05$) across 25% HQCP, 75% HQCP and 100% HQCP replacement levels. WBC and Eosinophils were significantly ($p<0.05$) higher on 0% HQCP level than on all other treatments. The range of value obtained for eosinophil (2.08 – 5.16 %) was within the range (1.67-5.00%), while basophil (0.00-2.48 %) was higher than (0.00 – 1.00%) reported for broiler by Asaniyan and Akinduro (2020).

CONCLUSION AND RECOMMENDATION

It is concluded that the growth performance and blood indices were influenced by the dietary treatment. Therefore, a 50% HQCP replacement of maize in broiler finisher diets could be an adequate substitute level without adverse effect on growth performance and health status.

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