HAEMATOLOGY AND CARCASS CHARACTERISTICS OF FINISHER BROILERS FED VARYING LEVELS OF CASSAVA PEEL MEAL ENRICHED WITH ENZYME AND METHIONINE

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ABSTRACT
Poultry feeding with most non-conventional feedstuffs, high dietary fibre is associated with negative connotation in relation to voluntary and nutrient digestibility. Supplementation of cassava peel with enzymes and methionine improve broilers performance. Haematological indices and carcass characteristics of broilers fed varied level of cassava peel meal (CPM) enriched with methionine and enzyme was studied. A total of 96 broiler chickens were used in the research work. The birds were randomly allotted to four experimental treatments, each having four replicates of eight birds per replicate in a completely randomized design (CRD). Four experimental diets were compounded to include cassava peel meal at 0, 15, 30, and 45% maize replacement in diets designated as T1, T2, T3, and T4 respectively. Haematological indices and carcass characteristics parameters of broilers fed were determined. Significant variations were observed in the haematological indices of white blood cells (WBC), mean corpuscular haemoglobin concentration (MCHC), and neutrophils, with values ranges from 228.14 to 239.31 x10^9/L, 31.87 to 33.50g/dL, 2.33 to 2.88% respectively. However, no significant variations were observed for the values obtained with birds fed diets 1, 2, and 3. A similar trend in observed values was obtained for carcass characteristics. No significant variation was observed in the birds fed diets 1, 2, and 3 for live weight, bled weight, eviscerated weight, and dressing percentage. Also, no toxic effect of CPM was observed from the viscerals at all levels of inclusion used in this experiment. Therefore, CPM replacement of maize at a 30% replacement level be encouraged.
Keywords: Broiler Chicken, CPM, Haematology, Carcass characteristics, Methionine-Enzymes

INTRODUCTION
The most important cost of animal production is feed (Kehinde *et al*., 2006). The primary objective in poultry production, broiler is the conversion of nutrients contained in feed into meat products and to secure high-quality carcass through fattening. However, the prices of conventional energy sources continue to rise, and it is becoming uneconomical to use them in poultry feed formulations (Esonu, 2006). This therefore necessitates the search for cheaper feedstuff, that are central to the research efforts of animal nutritionists in the tropics to find alternative feed ingredients that can substitute for more conventional feedstuffs that are not only very expensive but are more desperately needed for human feeding (Adeniji and Balogun, 2002). There are reports of the feeding of CPM to broilers but recommendations have been variable. The high fiber and low energy density, low protein content, dustiness, and likely content of hydrocyanic acid (HCN) have limited the full utilization of cassava peel in monogastric feeding (Ravindran, 1991). Various types of enzyme products have been used to improve the utilization of dietary fiber from CPM by poultry (Sundu *et al.,* 2009). Therefore, this study was carried out to evaluate the haematological indices and carcass characteristics of finisher broiler chicken fed CPM, enriched with enzymes and methionine.

MATERIALS AND METHODS
The study was conducted at the Poultry Unit of the Teaching and Research Farm of Prince Abubakar Audu University, Anyigba Kogi State. Four experimental diets were compounded, in which cassava peel meal enriched with enzymes and methionine as replacement of maize was incorporated at 0%, 15%, 30%, and 45% of maize-base in T1, T2, T3, and T4, respectively, where T1 serves as the control. A total of ninety six (96) unsexed day-old broiler chicks were purchased from a reputable poultry farm that were used for the feeding trial. The birds were allotted in a Completely Randomized

Design (CRD) into four (4) experimental treatments. Each treatment had three (3) replicates of eight (8) broiler chicks per replicate. The feeding trial lasted for twenty-eight days after the initial brooding period of twenty eight days when the birds were fed on a commercially purchased common diet. Vaccination and medication were provided, with feed and water given *ad-libitum*. Subsequently, data were collected for haematology and carcass characteristics. Data collected were subjected to one-way analysis of variance (ANOVA) and means that were significantly different were separated by Least Significant Difference using SPSS window version 16.

RESULTS AND DISCUSSION

The result of the heamatological test (Table1) shows no significant (P>0.05) difference for all parameters analyzed except for the WBC, MCHC and neutrophil. Eze *et al.* (2010) reported that haematological values such as PCV are of great importance in practical animal husbandry since they reflect the response of the animals to their environment and diseases. Despite the non-significant values obtained for PCV, the value range of 32.68-33.16% fall within the range of 32-35% reported by Oguntoye *et al.* (2018) for PCV. PCV when too high is an indicator of toxic factors that could have adverse effects on the formation of blood. Observed results for Haemoglobin. (Hb) showed a non-steady decline from T1 to T4 with a value range of 9.97 to 10.63g/dL. This is in line with reports by Unigwe *et al*. (2016), who reported reduced haemoglobin concentration with an increase in cassava peel meal in the broiler's diet. The significant difference (p<0.05) observed for WBC, follows a particular order of steady decline as the inclusion level of cassava peel meal increases. Values obtained were within normal range for birds as reported by Ahiwe *et al.* (2014). WBC have significant impact on the disease resistance of birds, especially with respect to the generation of antibodies and the process of phagocytosis (Alshelmani *et al.,* 2016). The RBC, MCV, MCH and lymphocytes were not significantly different (p>0.05) across treatments, however values obtained were within the normal range. RBC reduces with increasing CPM inclusion and MCV increases with increasing CPM inclusion. The MCHC, measures the concentration of haemoglobin in a given volume of packed RBC (Onyichi *et al.,* 2017). The significant difference (p<0.05) in the MCHC value obtained in this study falls within the range of 31.87 to 33.50 g/dl. This corroborates with the 33.23 to 34.03g/dl range reported by Oyewole *et al*. (2019) when layers were fed cashew pulp meal. There is a steady decrease in the values obtained for MCHC across the treatments, with an increase in the quantity of CPM inclusion. Obtained value for neutrophil implies high immunity of the birds especially the control and the 15%CPM inclusion. Values obtained corroborate with the 2.49% and 3.04% reported by Unigwe *et al*. (2016) when cassava peel meal was used in replacing maize at 30% in broiler's diet.

Table 1:Haematological indices of Finisher Broilers Fed diets containing CPM enriched with methionine and enzyme

Parameters	T1	T2	T3	T4	SEM	LOS
PCV (%)	33.16	32.94	33.01	32.68	1.61	NS
HB (g/dL)	10.17	10.63	10.55	9.97	0.96	NS
WBC ($x10^9$/L)	239.31^a	237.71^a	234.41^{ab}	228.14^b	6.84	*
RBC ($x10^{12}$/L)	3.21	3.17	3.12	3.09	0.42	NS
MCV (*fl*)	124.18	124.80	122.86	122.03	2.41	NS
MCH (*pg*)	38.89	39.14	38.61	37.95	2.47	NS
MCHC (g/dL)	33.50^a	33.27^a	32.44^a	31.87^b	1.43	*
Neutrophil ($x10^9$/L)	2.83^a	2.77^a	2.42^b	2.33^b	0.32	*
Lymphocyte ($x10^9$/L)	96.41	96.91	96.63	95.99	1.34	NS

a,b= Means with different superscripts on the same row differ significantly (P<0.05); CPM= cassava peel meal, T1(control, No CPM-Methionine supplementation); T2(15% CPM-Methionine supplemented); T3(30% CPM-Methionine supplemented); T4(45% CPM-Methionine supplemented); SEM=Standard Error of Mean, LOS= Level of Significance, NS= Not Significant (p>0.05), *= Significant (p<0.05); PCV = Packed cell volume, Hb = Hemoglobin, WBC = White Blood Cell, RBC = Red Blood Cell, MCV = Mean Corpuscular Volume, MCH = Mean Corpuscular Hemoglobin, MCHC = Mean Corpuscular Haemoglobin Concentration

From Table 2, it can be observed that results on carcass characteristics show significant variation ($P<0.05$) among treatments in the live weight, bled weight, eviscerated weight, dressing percentage, legs, wing, thigh, and drum stick. Head, breast, back, heart, liver, intestine, and gizzard percent were not significantly different ($P>0.05$) across the treatments. The significant variation recorded for the broilers' live weight, bled weight, eviscerated weight and dressing percentage could be occasioned by the nutritive value of the diet, though there was a steady decrease in the values obtained as the inclusion level of CPM increases across the treatments. The significant variation ($P<0.05$) obtained could probably be due to the utilization of nutrients from the diets which was reflected in their body weights and in turn resulted in the degree of carcass meatiness (Agunbiade, 2000). From the similar values obtained from the control up to 30%CPM inclusion, it becomes obvious that the birds were able to utilize the diet effectively as the enzyme, oil, and methionine aided in neutralizing most of the cyanogenic, fibrous, imbalanced amino acid, dustiness, and low metabolizable energy that negates the utilization of CPM at such levels (Oladunjoye *et al*., 2014). The internal organs yield was not significantly ($P > 0.05$) affected by dietary treatments. This suggests that the dietary treatments did not result in any significant negative metabolic reactions or disorders that could affect muscle growth, lipogenesis/lipolysis, or osteoblastic activity (Chuckwuka *et al*., 2010). The liver weight showed no statistical difference, meaning CPM was not toxic to the broilers because the highest liver weight (2.37%) obtained was similar to the values reported by Yakubu *et al*. (2017), who reported a liver weight of (2.40%) as the highest value. There was no significant difference ($P > 0.05$) observed in the weight of the heart. This is an indication that the heart was not under any stress to pump blood, which aids in the detoxification of cyanide that might be present due to the CPM inclusion. The non-significantly ($P > 0.05$) difference obtained for gizzard indicate that the fiber content of the various diets had no negative stress effect on the gizzard. It is evident therefore that the inclusion of CPM at varied levels in the diet of broiler chickens did not elicit any toxic response in the bird as the liver and kidney which are the major organs of detoxification did not undergo hypertrophy (Carew *et al*., 2003).

Table 2: Carcass Characteristics of Finisher Broilers Fed Diets Containing CPM enriched with methionine and enzyme

Parameters	T1	T2	T3	T4	SEM	LOS
Live weight (g)	2124.10^{a}	2090.42^{a}	2047.95^{a}	1962.41^{b}	115.27	*
Bled weight (g)	2100.48^{a}	2008.71^{a}	1998.00^{a}	1907.40^{b}	110.02	*
Eviscerated weight (g)	1804.19^{a}	1764.22^{a}	1750.73^{a}	1679.71^{b}	101.42	*
Dressing Percentage (%)	74.81^{a}	74.69^{a}	74.20^{ab}	73.46^{b}	1.10	*
Head (%)	4.53	5.00	5.18	4.87	0.69	NS
Legs (%)	4.40^{a}	3.94^{b}	4.38^{a}	4.00^{a}	0.19	*
Wing (%)	13.94^{a}	13.51^{a}	13.77^{a}	12.11^{b}	0.42	*
Thigh (%)	13.81^{a}	13.93^{a}	13.61^{a}	12.93^{b}	1.27	*
Drum Stick (%)	13.09^{a}	13.30^{a}	13.19^{a}	12.59^{b}	1.40	*
Breast (%)	25.90	26.94	26.80	25.55	1.42	NS
Back (%)	17.36	18.33	18.40	17.16	1.69	NS
Heart (%)	0.62	0.59	0.53	0.51	0.13	NS
Liver (%)	2.29	2.31	2.20	2.37	0.09	NS
Kidney (%)	0.15	0.22	0.21	0.20	0.07	NS
Intestine (%)	8.03	7.49	7.34	8.06	1.19	NS
Gizzard (%)	3.78	3.79	3.11	3.24	0.56	NS

^{abcde} Means with different superscript along the same rows show significant difference at $p>0.05$, CPM= cassava peel meal, T1(control, No CPM-Methionine supplementation); T2(15% CPM-Methionine supplemented); T3(30% CPM-Methionine supplemented); T4(45% CPM-Methionine supplemented); SEM= Standard Error of the Mean. NS= Not significant, LOS= level of significant, CPM= Cassava peel meal, DP= Dressing percentage

CONCLUSION

Study indicated that, the use of cassava peel meal supplemented with methionine and enzyme did not pose any adverse effect on the growth performance up to 30% cassava peel meal inclusion of the finisher broiler birds at the different treatment levels and should be included in the broiler's diet because of its capacity to sustain haematological indices and carcass characteristics of the broiler chickens.

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