CARCASS TRAITS AND HAEMATOLOGY OF BROILER FINISHER CHICKENS FED DIETS CONTAINING MAIZE OFFAL SUPPLEMENTED WITH RAXOZYME G® AS REPLACEMENT FOR WHEAT OFFAL

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ABSTRACT
A twenty-one days feeding trial was conducted to evaluate the carcass traits and haematology of finisher broiler chickens fed dietary levels of enzyme-supplemented (Raxozyme G 10g/kg) maize offal (ESMO) as replacement for wheat offal. Five diets were formulated in which ESMO replaced wheat offal at 0, 25, 50, 75 and 100% levels, coded as diets 1, 2, 3, 4 and 5 respectively. A total of three hundred finisher broiler chickens weighing between 922.27 and 1010.16g were randomly allotted to five treatments, replicated thrice in a completely randomized design. Each replicate contained 20 birds. Data was collected for carcass yield, organs' relative weights and haematological indices. Results showed that dressing percentage (69.31. 74.08%) was higher (P<0.05) on diets containing enzyme-supplemented maize offal. Similarly, organ weights as percentage of live weight, were significantly (P<0.05) affected for spleen (0.12 – 0.20%), abdominal fat (1.47 – 2.48%) and liver (1.37 – 1.67%). Values obtained for haematological parameters however, revealed that Packed Cell Volume (22.28 – 26.98%), haemoglobin (7.12 – 8.88g/dl) and Mean Corpuscular Volume (35.95 – 49.17 fl), were significantly (P<0.05) higher on diets 1 and 5. It was therefore concluded that replacing wheat offal with Raxozyme G-supplemented maize offal at 75% level in finisher broiler chickens improves dressing percentage without compromising haematological status.
Key words: Broiler, maize offal, Rozaxyme G®, Carcass, Haematology

INTRODUCTION
Broiler chicken meat constitutes a sizeable source of animal protein in the diets of many families in Nigeria. However, successful production of these birds requires adequate feeding which is estimated to stand at about 60 -80% of the total cost of production (Ojewola *et al.,* 2005). In order to reduce this cost so as improve farmers' profit margin and make available poultry meat at more affordable price, cheaper, readily available and less competitive, alternative feed ingredients need to be explored. The use of maize offal with or without enzyme supplementation to replace dietary maize or wheat offal has been studied (Nnenna *et al.,* 2006; Doma, 2020). Exogenous enzyme supplementation of animal feeds has been practiced with success since the late 80's (Brufau *et al.,* 2006). The inclusion of feed ingredients containing anti-nutritional factors may adversely affect poultry performance. However, supplementation with synthetic enzymes can enhance the nutritional value of these ingredients. Antinutritional factors, especially non-starch polysaccharides, have the ability to bind large quantities of water and hence increase fluid viscosity. This constitutes some challenges in nutrients digestion (Giraldo *et al.,* 2008). However, studies have shown that supplementation with enzymes can mitigate this problem. Apart from improving nutrient digestibility and utilization, enzyme supplementation also helps in lowering nutrient excretion, particularly excess nitrogen, phosphorus, zinc and copper (Abd El-Hack *et al.,* 2017; Alagawany *et al.,* 2017) which pollutes the soil.

MATERIALS AND METHODS
The experiment was carried out at the Poultry Unit, Teaching and Research Farm, Abubakar Tafawa Balewa University, Bauchi, located within the southern guinea savannah on latitude 10.31 N and longitude 9.84 E. The area has a mean annual rainfall of 1009 mm. Maize offal, Raxozyme G and other feed ingredients were purchased in Bauchi. Five broiler finisher diets were formulated to contain 0, 25, 50, 75 and 100% maize offal fortified with 10g/kg Raxozyme G®. The diets were designated as 1, 2, 3, 4 and 5 respectively. ingredients percentage composition and calculated analysis of the diets are presented in Table 1. Three hundred (300) finisher broilers weighing between 922.27 and

1010.16g were randomly allotted to five diets in a replicate of three, containing twenty birds each. Feed and water were served *ad libitum* and the study lasted for 3 weeks. At the end of the study, thirty birds (2 per replicated) were selected for carcass and blood analysis. Blood (5 ml per/bird) for haematological assay was drawn from the left wing web of each bird and collected in labelled tubes containing EDTA. Thereafter, the birds were weighed and slaughtered. Carcass measurements were taken using a 10 kg- weighing scale, while a sensitive electronic balance was used for organ weights, which were later expressed as percentage of live weight. Data generated was subjected to analysis of variance (ANOVA) using the SPSS software version 25, and where significant differences were observed, the Duncan's post hoc option (Duncan, 1955) was used to separate them.

Table 1: Ingredients Percentage Composition (%) and Calculated Analysis of Dietary Levels of Maize Offal Supplemented with Raxozyme® Finisher Broilers

	Diets				
Ingredient	**1**	**2**	**3**	**4**	**5**
Maize	51.96	51.96	51.96	51.96	51.96
Full-fat soya bean	23.54	23.54	23.54	23.54	23.54
Wheat offal	15.00	11.25	7.50	3.75	0.00
Maize offal	0.00	3.75	7.50	11.25	15.00
Fish meal	5.00	5.00	5.00	5.00	5.00
Bone meal	2.50	2.50	2.50	2.50	2.50
Limestone	1.00	1.00	1.00	1.00	1.00
Salt (NaCl)	0.25	0.25	0.25	0.25	0.25
Premix* (Finisher)	0.25	0.25	0.25	0.25	0.25
Methionine	0.30	0.30	0.30	0.30	0.30
Lysine	0.20	0.20	0.20	0.20	0.20
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis (%)					
Metabolizable energy (Kcal/kg)	3012.59	3015.21	3017.83	3019.46	3021.09
Crude protein	20.01	19.86	19.71	19.56	19.41
Crude fibre	3.61	3.74	3.87	4.00	4.13

RESULTS AND DISCUSSION

The carcass and organ characteristics of broiler chickens fed dietary levels of enzyme-supplemented maize offal are presented in Table 2. Except for dressing percentage, no carcass parameter was significantly ($P<0.05$) affected. Live weight, ranged from 1793.92 g (diet 4) to 1844.16 g (diet 1), plucked weight, 1665.61 g (diet 4) to 1714.04 g (diet 1), eviscerated weight, from 1473.32 g (diet 2) to 1513.34 g (diet 1) and carcass weight, from 1277.08 g (diet 1) to 1329.93 g (diet 4). However, birds fed diet 4 (74.08%) dressed higher ($P<0.05$) and compared favourably with those on diets 2 (71.43%), 3 (72.55%) and 5 (71.28%) while those on diet 1 (69.31%) dressed lower. Relative weight of organs expressed as percentage of live weight showed no significant influence ($P>0.05$) of diet for kidney and gizzard weights. However, weights of spleen, abdominal fat, liver and pancreas were significantly ($P<0.05$) affected. Spleen weight was higher on diet 3 (0.20%) which was similar to diets 1 (0.17%), 2 (0.14%) and 3 (0.18%) while diet 5 (0.12%) was lowest ($P<0.05$). Abdominal fat weight was also higher ($P<0.05$) on diets 2 (2.46%), 4 (2.48%) and 5 (2.38%) but did not differ from diet 3 (2.10%) while birds on diet 1 (1.47%) had a lower ($P>0.05$) value which was similar to diet 3. Liver weight was higher ($P<0.05$) on diet 5 (1.67%) and lower on diet 3 (1.37%). However, diets 1(1.45%), 2 (1.63%) and 4 (1.50%) did not differ from 3 and 5. The findings of this study agree with Hana *et al.* (2010) using multi-enzyme feed additive in broiler chicken rations. In a recent study, Oyeagu *et al.* (2019) reported a significantly ($P<0.05$) improved carcass yield when broiler chickens were fed diets containing brewers' dried grains fortified with synthetic enzyme. The significantly ($P<0.05$) higher dressing percentage obtained in this study for birds fed enzyme-supplemented maize offal based diets

at 75% level of substitution for wheat offal, is in agreement with a previous report by Aguihe *et al.*, (2016) using Maxigrain® in cassava peel based diets.

Haematological indices of broiler chickens fed diets containing enzyme-supplemented maize offal are presented in Table 3. Packed Cell Volume was higher (P<0.05) on diet 1 (26.98 %) which was similar to diet 5 (25.16%) and lower (P>0.05) on other diets. White Blood Cell count was not significantly (P>0.05) affected and varied between 6.74 to 7.10 x 10^3µl on diets 5 and 3 respectively. Red Blood Cell count was also not significantly influenced (P>0.05) by dietary treatment. Values which ranged from 5.52 to 6.40 x 10^6µl were obtained on diets 1 and 4 respectively. Haemoglobin concentration (Hb), however, differed significantly (P<0.05) among diets. Birds fed diet 1 (8.88 g/dl) had higher Hb which was comparable with those on diet 5 (7.95 g/dl), while values for those on diets 2 (7.12g/dl), 3 (7.69 g/dl) and 4 (7.53 g/dl) were the same and comparable with those on diet 5. Similarly, a significant influence (P<0.05) of diet was found on Mean Corpuscular Volume. The trend was similar to that of PCV and Hb. Diet 1 (49.17 fl) had a higher (P<0.05) MCV value which did not differ from diet 5 (42.46 fl), while diets 2 (35.95 fl), 3 (38.01 fl) and 4 (36.63 fl) were lower (P<0.05) and similar to diet 5. This result is in conflict with the report of Olowu *et al.* (2012) where no significant (P>0.05) differences among treatments were observed when broiler chickens were fed roxazyme G-supplemented maize offal based diets. The authors also reported a lower range for RBC (1.87 – 1.93 x 10^6/µl) than 5.22 – 6.40 x 10^6/µl obtained in the present study. This, according to (Nanbol *et al.*, 2016) could be informed by the difference in climate of the study locations.

Table 2: Carcass and Organs Characteristics of Finisher Broilers Fed Dietary Levels of Enzyme-Supplemented Maize Offal

	Diets					
Parameters	**1**	**2**	**3**	**4**	**5**	**SEM**
Live weight (g)	1844.16	1821.55	1809.72	1793.92	1820.64	18.43^{NS}
Plucked weight (g)	1714.04	1699.38	1683.46	1665.61	1686.49	16.58^{NS}
Eviscerated weight (g)	1513.34	1473.32	1497.89	1496.67	1513.65	16.91^{NS}
Carcass weight (g)	1277.08	1301.04	1311.46	1329.93	1297.75	17.76^{NS}
Dressing (%)	69.31^{b}	71.43^{ab}	72.55^{ab}	74.08^{a}	71.28^{ab}	1.40*
Organ weights expressed as percentage of live weight						
Gizzard weight	3.01	3.07	2.84	3.33	3.12	0.17^{NS}
Abdominal fat weight	1.47^{b}	2.46^{a}	2.10^{ab}	2.48^{a}	2.38^{a}	0.21*
Kidney weight	0.22	0.30	0.26	0.30	0.25	0.03^{NS}
Spleen weight	0.17^{ab}	0.14^{ab}	0.20^{a}	0.18^{ab}	0.12^{b}	0.02*
Liver weight	1.45^{ab}	1.63^{ab}	1.37^{b}	1.50^{ab}	1.67^{a}	0.09*

^{abc}Means bearing different superscripts within the same row differ; * = (P<0.05); NS= Not significant; SEM = Standard Error of Means

Table 3: Haematological Indices of Finisher Broilers Fed Graded Levels of Enzyme-Supplemented Maize Offal

	Diets					
Parameters	1	2	3	4	5	SEM
Packed Cell Volume (%)	26.98^{a}	22.28^{b}	23.15^{b}	23.96^{b}	25.16^{ab}	0.98*
White Blood Cell (x(10^3/µl)	6.84	6.78	7.10	6.85	6.74	0.71^{NS}
Red Blood Cell (x(10^6/µl)	5.52	6.29	6.25	6.40	5.94	0.55^{NS}
Haemoglobin (g/dl)	8.88^{a}	7.12^{b}	7.69^{b}	7.53^{b}	7.95^{ab}	0.32*
Mean Corpuscular Volume (fl)	49.17^{a}	35.95^{b}	38.01^{b}	36.63^{b}	42.46^{ab}	3.26*

NS= Not significant, SEM= Standard Error of the Mean, ^{ab}Means bearing different superscripts within the same row differ; * = (P<0.05),

CONCLUSION AND RECOMMENDATION

Based on the findings of this study, it was concluded that Razoxyme-G-supplemented maize offal can completely replace wheat offal in broiler finisher diets without reduction in carcass yield and deleterious effect on haematological indices. The use of maize offal supplemented with Raxozyme G at 10g/kg as replacement for wheat offal in broiler finisher diets is therefore recommended.

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