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HAEMATOLOGICAL INDICES OF BROILER FINISHER CHICKENS FED DIFFERENT HOURLY COOKED DOUM PALM (*HYPHAENE THEBAICA)* PULP MEAL DIETS

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ABSTRACT
A 28-day study was carried out to determine the effect of differently cooked doum palm (Hyphaene thebaica) pulp meal diets on haematological indices of broiler finisher chickens. A total of 216 day-old broiler chicks were randomly allotted to six treatments. Each treatment consisted of 36 birds with three replicates of twelve birds each in a completely randomized design (CRD). Six experimental diets were formulated and designated as follows: T_1 (Control) contained 0 % doum palm (Hyphaene thebaica) pulp meal while T_2, T_3, T_4, T_5 and T_6 contained 12.5% each as substitute for maize which were cooked for 20, 40, 60, 80 and 100 minutes respectively. Experimental feeds and water were provided ad libitum for all treatment groups. The results showed significant differences for Red blood cell count ($x10^3/mm^3$) across dietary treatments. Birds fed diets T_4, T_5 and T_6 had significantly ($p>0.05$) similar and highest values (2.70, 2.73 and 2.87 respectively) which was comparable with birds-fed control diet (T_1). Mean cell volume (fl) concentration ranged from 77.18 (T_3) to 90.03 (T_2). On the basis of the results obtained, it was concluded that inclusion of 12.5% of 20 to 100 minutes cooked doum palm (hyphaene thebaica) pulp meal in broiler diets did not pose any adverse effects on the haematological indices of broiler finisher chickens.

Keywords: Broiler, meal, haematology, doum palm, cooking

INTRODUCTION
Poultry industry has been negatively affected by Corona- virus (COVID-19 pandemic due to the hardship, disrupted production caused by the lockdown, transportation, declining consumer demand and volatile markets brought huge financial difficulties and closure of many farms. The prevailing high cost and scarcity of conventional feed ingredients as well as the substandard quality of the commercial poultry feed in most West African countries including Nigeria caused by COVID-19 has led to a sharp decline in poultry and livestock production (Kudu *et al.*, 2018; Babatunde, 2013). In Nigeria, maize is the most commonly used source of energy for poultry which usually constitutes about 40 -60 % of industrially formulated poultry diets (Heise *et al.*, 2015). The high cost of maize and other cereals is due to the competition between man and farm animals and their seasonal production. Many unconventional tropical feed resources and their by-products which have potential for use as alternative sources of feed for poultry could be exploited to reduce cost and limit the dependence on maize (Kudu *et al.*, 2008; Annongu, *et al.*, 2017). Many developing countries of the world has protein deficiency gap, especially that of high quality animal protein. This low animal protein intake has very serious implications on the health status and well-being of the citizenry (Ayanwale *et al.*, 2006). There is need to search for non-conventional feedstuffs like doum palm (*Hyphaene thebaica*) pulp meal diets which might reduce cost of poultry feed, meat and animal products. According to the reports of Waleed *et al.* (2014) and Abdulsalem *et al.* (2018), the mesocarp (pulp) of Doum palm pulp meal was found to contain 6.25 % ash, 89.25 % carbohydrate, 0.95 % oil, 316 mg/g glucose, 6.09 % protein but high calorific values of 3234 kcal/kg. Nwosu *et al.* (2008) reported that the pulp is rich in energy 3655.9 kcal/kg and minerals such as Calcium (245.10 mg/100 g), Magnesium (236.45 mg/100 g), Iron (47.96 mg/100 g), Copper (0.38 mg/100 g) and Zinc (0.62 mg/100 g).This research is aimed to determine the effect

of differently cooked doum palm (*Hyphaene thebaica)* pulp meal diets on the haematological indices of broiler finisher chickens fed different hourly cooked doum palm (*hyphaene thebaica)* pulp meal diets

MATERIALS AND METHODS

Experimental site

The study was carried out at the Teaching and Research Farm of the Department of Animal Production, School of Agriculture and Agricultural Technology, Federal University of Technology Minna, Bosso Campus Niger State, Nigeria. Minna is located within latitudes 4° 30' 09°30' and 09° 45'N and longitudes 06° 30' and 06° 45' E with an altitude of 1475 m above sea level (Climatemp, 2016). Minna falls within the Southern Guinea Savannah vegetation zone of Nigeria with average annual rainfall of between 1100 and 1600 mm and a mean temperature of between 21 °C to 36.5 °C. Minna experiences two distinct seasons (dry and rainy seasons). The dry seasons starts from November to April while the rainy season last from April to October.

Sourcing and processing of test ingredients

The feed materials used in this study include maize, doum palm pulp meal, soybean meal, fishmeal, groundnut cake, maize offal, bone meal, limestone, common salt, palm oil, premix, L-lysine and DL-methionine. All were purchased in Minna at Farida feed milling Industry. No. 7 Gida Matasa, Minna Niger State. While the mature ripe doum palm (*Hyphaene thebaica*) fruits were sourced from Mashi Local Government of Katsina State. Samples of Doum Palm (*Hyphaene thebaica*) fruit were washed and cooked at a temperature of 100°C for different time interval (0, 20, 40, 60, 80 and 100 minutes respectively) for treatments 1, 2, 3, 4, 5 and 6 at the rate of 1kg per 5 litres of portable water using the method described by Nafiseh *et al.* (2013). The water was drained and the cooked fruit mesocarps were removed with knife and air-dried at 25°C for 72 hr after which it was milled using hammer mill and incorporated in the broiler chickens diets. Sample of the cooked doum palm pulp meal was analyzed for the proximate composition according to AOAC (2000) and then used to formulate the experimental diets.

Management of experimental animals

A total of 216 day- old Ross 308 broiler chicks were randomly allotted to six treatments. Each treatment consisted of 36 birds with three replicates of twelve birds each in a completely randomized design (CRD). Feeds and water were provided *ad libitum* for all treatment groups. At seven weeks of age, three birds (3) each were randomly selected from each replicate on weight equalization basis to determine the effects of diets on blood compositions. Blood samples were collected terminally from each bird through the wing vein using hypodermic needle with syringe. 5ml of blood samples was collected from each bird into a labeled ethylene diamine tetra acetic acid (EDTA) specimen bottles for haematological indices determination. Data were collected on Haemaglobin (g/dl), Packed cell volume (%), Red blood cell count ($X10^6/mm^3$), Mean cell volume (fl), Mean cell Haemoglobin (pg), Mean cell Haemoglobin Conc.(g/dl), Total white blood cell count ($X10^3/mm^3$), Neutrophils (%), Lymphocytes (%), Monocytes (%) and Eosinphils (%)

Experimental diets

Six experimental diets were formulated and designated as follows: T_1 (Control) contained 0 % doum palm (*Hyphaene thebaica)* pulp meal while T_2, T_3, T_4, T_5 and T_6 contained 12.5% each as substitute for maize which were cooked for 20, 40, 60, 80 and 100 minutes respectively. Compositions of the experimental diets are presented in Table 1.

Statistical analysis

Data collected were subjected to analysis of Variance using SAS software (SAS, 2015). While significant means were separated with Duncan multiple range test at 5% level of significance.

RESULTS AND DISCUSSION

The results of the haematological indices of broiler finisher chickens fed different hourly cooked doum palm (*hyphaene thebaica)* pulp meal diets are presented in Table 2. The results showed no significant ($p>0.05$) different across the treatment groups for haemoglobin (g/dl), mean cell haemoglobin (pg), mean cell haemoglobin concentration (g/dl), total white blood cell count ($x10^3/mm^3$), neutrophils (%),

lymphocytes (%), monocytes (%) and Eosinophils (%). Packed cell volume (PCV), red blood cell (RBC) and mean cell volume (MCV) were significantly ($p>0.05$) influenced by the dietary treatments.

Packed cell volume concentration ranged from 18.00% (T2) to 24.67 % (T6). Birds fed diet T5 and T6 had significantly ($p>0.05$) higher values of PCV (22.33 and 24.67 respectively) followed by birds fed diet T3, T4 and T5 (22.00, 22.00 and 22.33 respectively) which was similar ($p>0.05$) with birds fed control diet (22.00). Birds fed diet T2 recorded significantly ($p<0.05$) lowest mean values of PCV (18.00). Red blood cell count ($x10^3/mm^3$) ranged from 2.27 (T2) to 2.87 (T6). There were significant differences for Red blood cell count ($x10^3/mm^3$) across dietary treatments. Birds fed diets T4, T5 and T6 had significantly ($p>0.05$) similar and highest values (2.70, 2.73 and 2.87 respectively) which was comparable with birds fed control diet (T1). Birds fed diet T2 had significantly ($p<0.05$) lowest value of Red blood cell count (2.27 $x10^3/mm^3$).

Mean cell volume

Table 1: Ingredients (%) and calculated nutrient composition of the Experimental broiler Finisher diets for feeding trial 2

Ingredients (%)	T1	T2	T3	T4	T5	T6
Maize	57.00	49.88	49.88	49.88	49.88	49.88
Doum palm meal	0.00	7.12	7.12	7.12	7.12	7.12
Maize offal	5.00	5.00	5.00	5.00	5.00	5.00
GNC	15.00	15.00	15.00	15.00	15.00	15.00
Soya cake	16.00	16.00	16.00	16.00	16.00	16.00
Fish meal	2.00	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00	1.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00
Palm oil	1.00	1.00	1.00	1.00	1.00	1.00
Common salt	0.25	0.25	0.25	0.25	0.25	0.25
*Vitamin Premix	0.25	0.25	0.25	0.25	0.25	0.25
L-lysine	0.25	0.25	0.25	0.25	0.25	0.25
Dl-Methionine	0.25	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**	**100**
Calculated nutrients (%)						
ME(Kcal/kg)	3055.39	3055.83	3035.39	3004.55	3018.81	3035.19
Crude protein	20.05	20.04	20.09	20.07	20.08	20.08
Ether extract	5.81	5.66	5.66	5.66	5.66	5.66
Crude fibre	5.40	5.42	5.42	5.42	5.42	5.42
Calcium	1.19	1.20	1.20	1.20	1.20	1.20
Phosphorus	0.63	0.64	0.64	0.64	0.64	0.64
Lysine	1.14	1.14	1.14	1.14	1.14	1.14
Methionine	0.64	0.64	0.64	0.64	0.64	0.64

*Finisher premix will supply the following per kilogram of feed: Vit A, 10000 I.U.; Vit D3 2000 i.u.; Vit E, 23mg; Vit K,2mg; Vit K2mg; B1 (thiamine) 1.8mg; Vit B2 (Riboflavin), 5.5mg; Vit B6 (Pyridoxine),3.0mg; Vit. B12, 0.015mg; Pantothenic acid, 7.5mg; Folic acid, 0.75mg; Biotin, 0.06mg; Choline chloride, 300mg; Cobalt, 0.2mg; copper, 3mg; Iodine, 1mg; Iron 20mg; manganese, 40mg; Selenium 0.2mg; Zinc, 30mg; Antioxidant, 1.25mg. ME= Metabolizable Energy.

Table 2: Haematological indices of broiler chickens fed different hourly cooked doum palm pulp meal diets

Parameters %	T1	T2	T3	T4	T5	T6	SEM	P-value
Haemaglobin (g/dl)	7.33	7.10	7.10	7.43	7.57	7.73	0.58	0.8392

Packed cell volume (%)	22.00^{b}	18.00^{c}	22.00^{b}	22.00^{b}	22.33^{ab}	24.67^{a}	1.30	0.0054
Red blood cell count ($X10^6/mm^3$)	2.60^{a}	2.27^{b}	2.33^{b}	2.70^{a}	2.73^{a}	2.87^{a}	0.17	0.0299
Mean cell volume (fl)	84.76^{a}	90.03^{a}	77.18^{c}	81.59^{bc}	81.67^{b}	86.16^{a}	3.76	0.0684
Mean cell Haemoglobin (pg)	29.06	30.87	25.87	26.91	27.55	27.30	2.61	0.0670
Mean cell Haemoglobin Conc.(g/dl)	34.27	34.25	32.24	33.00	33.73	31.72	1.19	0.2292
Total white blood cell count ($X10^{3/}mm^3$)	112.33	112.67	119.33	117.00	116.67	121.67	6.85	0.7207
Neutrophils (%)	40.67	28.00	33.67	33.00	33.67	32.00	7.67	0.7201
Lymphocytes (%)	50.67	66.00	59.00	60.00	61.33	62.00	7.52	0.1671
Monocytes (%)	1.33	2.00	2.00	2.00	1.33	2.00	0.32	0.0658
Eosinphils (%)	2.00	1.34	2.00	2.67	2.00	2.00	0.43	0.1645

T_1 = (0 hour cooked) doum palm pulp meal
T_2, T_3, T_4, T_5 and T_6= 20, 40, 60, 80 and 100 minutes cooked doum palm pulp meal diets.
SEM: standard error of mean.

(fl) concentration ranged from 77.18 (T3) to 90.03 (T2). Birds fed diets T2 and T6 had similar and highest values (90.03 and 86.16) but was not significant ($p>0.05$) with those birds fed Control diet (T1) with values of 84.76 (fl). This result confirms the report of Nafiseh *et al.* (2013) who reported that processing of doum palm pulp meal (*Hyphaene thebaica)* by cooking led to significant ($P<0.05$) increase in the availability and digestibility of nutrients by broiler chickens. Makinde *et al.* (2018) also reported that inclusion of doum palm pulp meal in broiler finisher diets did not impair the haematological parameters.

CONCLUSION

Based on the findings of these studies, it was concluded that 12.5% of 20 to 100 minutes cooked doum palm (*hyphaene thebaica)* pulp meal could be used in broiler diets without any adverse effects on the haematological indices of broiler finisher chickens.

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