HAEMATOLOGICAL AND SERUM BIOCHEMISTRY OF BROILER CHICKENS FED VARYING LEVELS OF RAW DOUM PALM MEAL (RDPM) (H*yphaene thebaica*)

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ABSTRACT

An 8week study was conducted to evaluate the effects of raw doum palm meal (RDPM) as substitute for maize on the haematological and serum biochemical characteristics of broiler chickens. A total of 120-day-old broiler chicks were randomly allotted to five treatments. Each treatment consisted of 24 birds with three replicates of eight birds each in a completely randomized design (CRD). Five experimental diets were formulated to meet nutrient requirement standards of broilers (NRC, 1994), and were designated as follows: T_1(control) contained 0% raw doum palm (*hyphaene thebaica*) meal while T_2, T_3, T_4, and T_5 contained 2.5%, 5.0%, 7.5% and 10.0% respectively. Experimental feeds and water were provided ad libitum for all treatment groups. The results showed significant differences for blood cholesterol (x103/mm3) across dietary treatments. Birds fed diets T_2 had significantly ($p<0.05$) similar and highest values (3.35 and 3.55 respectively) which was comparable with birds fed control diet (T_1). Mean cell volume (fl) concentration ranged from 78.00 (T_4) to 87.50 (T_5). On the basis of the results obtained, it was concluded that inclusion of up 10% of raw doum palm (*hyphaene thebaica*) pulp meal in broiler diets did not pose any adverse effects on the haematological and serum biochemical characteristic of broiler.

INTRODUCTION

Poultry farming has become an important money-making industry in Nigeria today. The largest dietary requirements for poultry are energy and protein (Kanyinji and Moonga, 2014) and they are predominantly supplied by maize grain and soybean meal in poultry diets, respectively. The high cost of these feed ingredients resulting from diverse usage in human diets as well as industrial applications makes it necessary to search for alternative replacements that are cost effective. There are many unconventional tropical feed sources and their by-products which have the potential to be used as alternative sources of feed for poultry which when exploited to reduce production cost and limit the reliance on maize (Kudu *et al*., 2008; Annongu, *et al*., 2017; Makinde *et al*., 2021). Raw doum palm meal is a potential feed resource and it is a non-conventional energy source that can be fed to poultry in place of maize because of its closeness in biological value. The use of raw doum palm meal may augment the problem of over dependence and high cost of conventional energy ingredients like maize. Doum flour has a

high level of protein ranging from 2.86 to 5.01%, a large amount of lysine and cysteine in raw protein ranging from 4.09 to 4.16% and 0.2 to 1.62%, respectively, a few amino acid threonines, raw lipid ranging from 1.2 to 8.4%, crude fiber ranging from 52.26 to 66.5%, the most essential carbohydrates constituent mannose ranging from 13 to 75.9%, and the occurrence of calcium, tannic acid, terpenoids, steroids, glycosides, flavonoids, terpenes, and terpenoids were identified in minimum to moderate amounts in the doum flour (Auwal *et al*., 2013). The fruit pulp, according to Eissa *et al*. (2008), comprises 4.91 % proteins, 5.26 % fat, 4.5 % ash, and 85.33 % total carbohydrate. Animal health condition is monitored using blood extensively (Babeker and Elmansoury, 2013). The measures of an animal's hemoglobin and serum biochemistry are reliable indicators of its physiological health, and changes in these parameters can help determine how an animal will react to different physiological conditions (Khan and Zafar, 2005). Haematological investigations assist clinicians in identifying a variety of disorders as well as analyzing the level of damage to blood and haematopoietic organs such as the spleen and the bone marrow (Shrivastav and Singh, 2012), in addition to their utility in detecting and monitoring diseases and abnormalities (Fielder, 2019). Haematological measures can be used to evaluate the clinical states of animals and are reliable markers of the physiological status of animals (Ariyibi *et al*., 2002, Bezerra *et al*., 2017). When Doum's biological action was tested in rat feeding tests, it was found to reduce blood pressure (Betty *et al*., 2006).

This study was aimed at determining the haematological and serum biochemical profile of broiler chickens fed varying levels of raw doum palm meal.

Materials and Methods

The research was carried out at the Poultry unit of the Teaching and Research farm of the Department of Animal Production, School of Agriculture and Agricultural Technology, Federal University of Technology, Minna, Niger State. The annual rainfall ranges between 1200mm-1300mm and its temperature ranges from 38^0C-42^0C. The Vegetation of Minna is located at the Guinea savannah zone and lies within Latitude 9.5836^0N and Longitude 6.5463^0E. (Wikipedia, 2021).

Preparation of Raw doum palm meal (RDPM)

The dried doum palm fruits were purchased from Kure ultra-modern market, minna. After removing the bad ones, mortar and pestle was used to separate the pulp from kernel and the sample (doum palm pulp) then ground into fine particles called the Doum palm meal, while the other ingredients used for the feed such as groundnut cake (GNC), fish meal, maize offal, bone meal, limestone, methionine and premix were purchased from Animal care store, Minna, Niger State.

Management of experimental birds and blood collection

One hundred and twenty (120) day old Agrited Chickun broiler chicks purchased from animal health care store were randomly allotted to five treatments. Each treatment consisted of 24 birds with three replicates of eight birds each in a completely randomized design (CRD). Feed and water was provided *ad libitum* for all treatment groups. At the end of the study, two (2) birds each were randomly selected from each replicate on weight equalization basis. 2 ml of blood was collected through the wing vein and put into bottles containing Ethylene Diamine tetra- acetic Acid (EDTA) to determine the packed cell volume (PVC), red blood cell (RBC), haemoglobin (Hb), and white blood cell (WBC). Before collecting the samples, the collection spots were cleaned thoroughly with a clean cotton wool and Methylated spirit to avoid infection on the collection point. Blood sample meant for serum biochemical studies were collected into plane bottles (without Anti-coagulant) to enhance serum separation. The blood serum obtained was used to determine total protein (TP), Albumin, Globulin, Glucose and Urea. All the analysis was done at the Falal-Rabi Medical Laboratory Services, Tunga according to the methods described by Kohn and Allen (1995); Schalm *et al*. (1975) and Peters *et al*. (1982).

Experimental Diets

The experimental diets were formulated to meet the nutrient requirement standards of broilers (NRC, 1994) and designated as follows: T_1(control) contained 0% raw doum palm (*hyphaene thebaica*) meal while T_2, T_3, T_4, and T_5 contained 2.5%, 5.0%, 7.5% and 10.0% respectively replacing maize in the diets of the birds. The gross composition of the experimental diets are presented in Table 1 while the proximate composition of raw doum palm meal (RDPM) is presented in Table 2.

Statistical analysis

Data generated from the study were subjected to one-way analysis of variance (ANOVA) using software (SAS, 2008). Means were separated with Duncan multiple range test at 5% level of significance.

RESULTS AND DISCUSSION

The result of the haematological indices of broiler chickens fed varying levels of raw doum palm meal diets are presented in Table 2. The results showed no significant ($p>0.05$) difference across the treatment groups for all parameters, Haemoglobin (g/dl), red blood cell (RBC), packed cell volume (PCV), white blood cell, (WBC), and mean corpuscular volume, (MCV). Makinde *et al*., (2018) observed that the inclusion of raw doum palm meal in broiler finisher diets did not affect the haematological parameters.

The results of the serum biochemical indices of broiler chickens fed raw doum palm seed meal-based diets are presented in Table 3. The results show that dietary treatment had effects ($p<0.05$) on the cholesterol level. However, all other parameters (Alkaline Phosphate, SGOT, SGPT and Total Protein) were not affected ($p>0.05$) by the dietary treatments. Blood

cholesterol concentration ranged from 2.45 (T_2) to 3.55 (T_5). Birds fed diet T_3 and T_5 had significantly ($p>0.05$) higher values of blood cholesterol (3.05 and 3.55 respectively) followed by birds fed T_4 and T_4 (3.00). Birds fed diet T_2 recorded significantly ($p<0.05$) lowest mean values of blood cholesterol (2.45). The significant difference observed in blood cholesterol implied that raw doum palm meal had no adverse effect on health status of chickens. The decrease observed in blood cholesterol among birds fed T_2 diets agrees with the findings of Annongu *et al.,* (2017) who reported a decrease in blood cholesterol of broiler chickens fed raw African star apple (Chrysophyllum albidum) kernel meal-based diets.

CONCLUSION

Based on the findings of these studies, it was concluded that up to 10% of raw doum palm meal (RDPM) could be used in broiler diets without any adverse effects on the haematological and serum biochemical indices of broiler chickens at both starter and finisher phases.

Table 1. Gross composition of experimental diets

	Dietary levels of Raw doum palm meal (%)									
	Starter diets					Finisher diets				
Ingredients, Kg	0	2.5	5	7.5	10	0	2.5	5	7.5	10
Maize	49.00	47.78	46.55	45.33	44.10	66.00	64.35	62.70	61.05	59.40
*Raw Doum palm	0.00	1.22	2.45	3.67	4.90	0.00	1.65	3.30	4.95	6.60
Maize offal	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Soya bean meal	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
GNC	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50
Fish meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Limestone	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Salt	0.25	0.25	0.25	0.25	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	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
DI-Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100	100	100	100	100	100
Calculated nutrients (%)										
ME(Kcal/kg)	2970	2967	2963	2960	2956	3048	3020	3016	3023	3056
Crude protein	21.44	21.38	21.32	21.27	21.21	20.42	20.13	20.07	20.10	20.12
Proximate analysis (%)										
Dry matter	90.54	91.89	91.68	90.94	90.86	89.54	90.17	90.86	90.62	91.04
Crude protein	23.61	23.33	24.00	23.16	24.12	22.98	23.00	22.78	22.91	23.06
Crude fibre	7.46	7.35	8.11	7.38	7.49	8.33	8.47	7.66	7.98	8.46
Ether extract	8.34	8.47	9.11	9.16	9.43	8.72	7.41	6.38	6.71	7.63
Ash	6.38	5.11	6.47	6.30	6.47	5.22	5.61	6.38	7.11	7.24
NFE	44.75	47.63	43.99	44.94	43.35	44.29	45.68	47.66	45.91	44.65

*Biomix chick premix will provide the following per kilogram of feed: Vit. A, 10,000 i.u; Vit. D_3, 2000 i.u; Vit. E 23mg; Vit. K, 2mg; Vit B_1 (Thiamine), 1.8mg; Vit B_2 (Riboflavin), 5.5mg; Vit. B_6 (Pyridoxine), 3mg; Vit. B_{12} 0.015mg; Pantothenic acid 7.5mg; Folic acid 0.75mg; Niacin 27.5mg; Biotin 0.6mg; Chlorine chloride 300mg; Cobalt 0.2mg; Copper 3mg; Iodine 1mg; Iron 20mg; Manganese 40mg; Selenium 0.2mg Zinc 30mg; Antioxidant 1.25mg. ME = Metabolizable Energy. GNC = Groundnut cake

Table 2: Proximate composition of Raw doum palm meal

Nutrients	Concentration (%)
Dry matter	94.39
Crude protein	4.30
Crude fibre	13.50
Ash	6.24
Ether extract	3.40
Nitogen free extract	66.95
Metabolizable energy (Kcal/kg)	3156.0
Phytochemicals (%)	
Tanin	0.31
Saponin	1.02
Oxalate	0.67
Phytate	1.13
Alkaloid	2.06

Table 3: Haematological parameters of broiler chickens fed varying levels of raw doum palm meal diets

Parameters	0	2.5	5	7.50	10	SEM	P-value
Haemoglobin, g/dl	7.90	9.45	7.95	8.00	8.15	0.397	0.803
Red blood cell, x 10^{12}/l	2.90	3.20	3.05	3.00	2.90	0.064	0.661
Packed cell volume, %	23.50	27.50	26.00	23.50	24.00	1.233	0.876
White blood cell 10^9/l	326.00	296.00	273.50	314.00	332.00	9.032	0.229
MCV, fl	81.00	85.00	83.00	78.00	87.50	2.321	0.834

[ab]mean on the same column with different superscript are significantly different ($p<0.05$). SEM=Standard error of mean. MCV=Mean cell volume.

Table 4: Serum Biochemical Indices of Broiler Chickens Fed Varying Levels of Raw Doum Palm Meal Diets

Parameters	0	2.5	5	7.50	10	SEM	P-value
Cholesterol	3.35[a]	2.45[b]	3.05[ab]	3.00[ab]	3.55[a]	0.135	0.026
ALP, IU/L	142.40	167.20	110.75	115.30	129.85	8.901	0.277
SGOT	14.35	16.45	29.85	17.45	20.10	2.853	0.554
SGPT	13.70	17.65	18.20	13.65	17.05	1.364	0.816
Total protein, g/l	2.90	3.25	2.95	2.90	3.40	0.092	0.303

[ab]means on the same column with different superscript are significantly different ($p<0.05$). SEM=Standard error of mean. ALP=alkaline phosphate. SGOT = Serum glutamate oxaloacetate transaminase. SGPT = Serum glutamate pyruvate transaminase

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