HEAMATOLOGY AND SERUM BIOCHEMISTRY OF BROILERS CHICKENS FED DIETS CONTAINING GRADED LEVELS OF PAWPAW (*Carica papaya*) LEAF MEAL

[*a]Adelowo Olayinka V,, [a]Zungum Aliyu G. [a]Alkasim Idris A., [a]Olaiya Olalekan D, [c]Oshibanjo Olusegun D [b]Solomon Blessing N. and [a]Dassam Repentance E.
[a]Department of Animal Production Technology, Federal College of Animal Health and Production Technology, Vom, Plateau State
[b]Department of Animal Health Technology, Federal College of Animal Health and Production Technology, Vom, Plateau State
[c]Department of Animal Production, University of Jos, Plateau State
[*]Corresponding Author: olufisayo71@gmail.com

ABSTRACT
One hundred and fifty broiler chickens (150) were randomly allotted into five dietary treatments consisting of graded levels (0%, 1.5%, 3%, 4.5% and 6%) of pawpaw leaf meal in a completely randomized design. At the end of the six (6) weeks trial, from a total of 15 birds (three birds from each treatment), blood samples were collected using sterile syringe and needle from the wing vein into a Plain sample container and labeled properly. Samples were taken to the laboratory for heamatology and biochemical analysis. The parameters measured include the Hematological indices (White Blood Cells ($x10^{12}$/l), Haemoglobin (g/dl), Packed Cell Volume (%), Mean Corpuscular Volume, Neutrophils, Lymphocytes) while the Biochemical parameters include Total Protein, Albumin, Globulin, and Alanine Transaminase The results showed significant difference in the heamatological profile across the treatments while the biochemical profile showed no significant difference in the Alanine Transaminase but other parameters were significantly different across the treatments. This shows that Pawpaw leaf meal at 6% level of inclusion affect the blood profile of broiler chickens positively and can be included in their diets for better performance.

Key words: Broilers, Pawpaw, leaf meal, Heamatology, Serum biochemistry

DESCRIPTION OF PROBLEM
As the global population increases, meat production from animal sources needs to also increase to meet the demand of the 9 billion people predicted to inhabit the world by 2050. Poultry production is one of the most effective ways to achieve sustainable and rapid production of high-quality meat to meet the supply of animal protein. However, the major constraint in poultry production is the high cost of conventional feed ingredients with short supplies which resulted in increased production cost. The use of pawpaw (*Carica papaya*) leaf meals plays a major role in the health, production and growth of broiler chickens from starter to finisher phases (1). Therefore, nutrient supplements and feed additives are commonly incorporated into the formulation of poultry diets to ensure healthy performance of broiler chickens (2; 3), Phytogenics are naturally sourced from plants. (4) also corroborated that plant parts or their extracts are of benefit to livestock production. Pawpaw (*Carica papaya*) leaves contain flavonoids that have been reported to exert high antibacterial activity capable of combating various resistant bacterial strains (5). The Pawpaw (*Carica papaya*) leaf meal contains various classes of natural products such as phytosterols and triterpenes, fatty acids with olefinic, acetylenic bonds, furanoic acid, dimmers of flavonols and oligomeric olefinic, proanthocyanidins, β-D-glucoside of 8-hydroxyabscisic acid and epi-dihydrophaseic acid β-D-glucoside (6). (7) reported that Pawpaw (*Carica papaya*) leaf meal usually discarded as a waste has appreciable concentration of minerals, notably potassium, phosphorous, magnesium and calcium. The main bioactive compounds described in Pawpaw *Carica papaya* leaf meal and its wastes are polyphenols, followed by carotenoids, tocopherols, and sterols. The substituted pawpaw *Carica papaya* leaf meal Powder for soya bean cake in broiler diets revealed zero mortality which sustained growth and steady weight gain in the broiler finisher chickens fed the diets (8). This study seeks to assess the heamatological and serum profile of

broiler chickens fed diets fortified with pawpaw *Carica papaya* leaf meal.

MATERIALS AND METHODS

The study was conducted at the Teaching and Research farm of Federal College of Animal Health and Production Technology, National Veterinary Research Institute Vom, Jos South Local Government Area of Plateau State which is located at the at 9°43'00″N and 8°45′00″E. of the equator with annual rainfall of 1300ml to 1500ml and height of about 1285ml above sea level. Vom has a remarkable cool climate in December and January. The night may be extremely cool. The wet season extends from late April to middle October.

Management of birds and Experimental Design

A total of one hundred and fifty (150) day-old boiler chicks were randomly allotted into five treatments T1, T2, T3, T4 and T5 respectively. Each treatment had three replicates with ten (10) birds per replicate, in a completely randomized design. The treatments consisted of 0%, 1.5%, 3%, 4.5% and 6% inclusion of pawpaw leaf meal. The birds were housed in a deep litter system where they received uniform care and management and the experiment lasted for six weeks. Light was provided 24 hours daily, while feed and clean cool drinking water were given *ad libitum* throughout the experimental period. At the end of the experiment (after 6 weeks) a total of 15 birds (i.e. three birds from each treatment), blood samples were collected by using sterile syringe and needle from the wing vein randomly from the broiler chickens into a Plain sample container (EDTA free) and labeled properly. Samples were taken to Biochemistry laboratory, National Veterinary Research Institute, Vom for heamatology and biochemical analysis.

Data Analysis

Data obtained was subjected to one-way analysis of variance (ANOVA) using the statistical product and service solution or statistical package for social science (9) where significance difference was tested at 5% level of significance; mean was separated using Duncan's multiple range test of the same statistical package.

RESULTS AND DISCUSSION

Table 1 result indicates that *red blood cell* (RBC) in T5 has the highest (3.90%) and the lowest in T4 (2.40%). *White blood cell* (WBC) in T5 has the highest (1.85%) and the lowest inT1 (1.05%). *Hemoglobin concentration* T4 highest (10.55 %), the lowest in T2 (8.25%). *Pack cell volume* in T3 and T4 has the highest equal (33.50%) and the lowest in T5 (28.50%). *Mean Corpuscular Volume* (MCV) has the highest percentage in T1 (305.00%) and the lowest in T5 (155.00%). *Mean Capsular hematological concentration* (MCHC) has the highest percentage in T1 (90.60%), and the lowest in T5 (50.60%). *Neutrophils* have the highest percentage in T5 (376.00%), and the lowest in T3 (252.00%). Lymphocytes have the highest % in T2 (88.00), and the lowest in T4 (68.50). However, the result suggested that the dietary inclusion of pawpaw leaf meals improves the hematological profile of broiler chickens.

Table 1. Hematological indices of broiler chickens fed diets containing graded levels of pawpaw (*C. papaya*) leaf meal

	Dietary levels of pawpaw leaf meal (%/kg)						
Parameters	0%	1.5%	3%	4%	6%	S E M	**P-Value**
Red Blood Cells (x10^{12}/l)	2.70^{bc}	3.00^{bc}	3.40^{ab}	2.40^{c}	3.90^{a}	0.15	**0.001***
White Blood Cells (x10^{12}/l)	1.05^{c}	1.48^{ab}	1.80^{a}	1.40^{bc}	1.85^{a}	0.06	**0.001***
Haemoglobin count (g/dl)	9.50^{ab}	8.25^{b}	10.10^{a}	10.55^{a}	9.30^{ab}	0.23	**0.015***
Packed Cell Volume (%)	32.00^{ab}	30.50^{ab}	33.50^{a}	33.50^{a}	28.50^{b}	0.59	**0.001***
Mean Corpuscular Volume	305.00^{a}	211.00^{c}	191.50^{c}	240.00^{b}	155.00^{d}	8.75	**0.001***
Mean Capsular Haem.count	90.60^{a}	58.15^{c}	56.55^{c}	76.20^{b}	50.70^{c}	2.63	**0.001***
Neutrophils	297.00^{bc}	272.00^{bc}	252.00	315.00^{b}	376.00^{a}	10.88	**0.001***
Lymphocytes	86.00^{a}	88.00^{a}	86.50^{a}	68.50^{b}	81.50^{a}	1.84	**0.001***

$^{a, b, c, d}$ Means in the same row with different superscripts are significantly different (P<0.05)
S E M = Standard Error of Mean.

The result of the serum biochemical evaluation of broiler chickens given different levels of Pawpaw (*Carica papaya*) leaf meal aqueous extract is presented in Table 2 showing significant difference across the treatment except for ALT (µl). The observed result indicates that Total Protein, Albumin, Globin, Alkaline Phosphatase, Aspartate transaminase and Alanine Transaminase were significant (P<0.05) between some different treatment groups while others recorded no significant difference. Total protein not significantly differed (P>0.05) across treatments 1, 2 and 5 but treatments had significant difference when compared to treatment 3 and 4. Highest value of (43.57 g/l) was recorded for 10% (T1). A range of 43.57 to 33.68 was obtained for total protein.

Table 2: Biochemical parameters of broiler birds fed diet containing Pawpaw (*Carica papaya*) leaf meal

Parameters	Treatment (Concentration/100kg feed)					Mean SEM
	T 1 (0%)	T 2 (1.5%)	T 3 (3%)	T 4 (4.5%)	T5 (6%)	
ALT (µl)	39.67	39.67	38.00	37.33	38.00	38.53±0.35
TP (g/l)	43.57^{b}	42.07^{b}	33.68^{a}	36.44^{a}	40.41^{ab}	39.23±2.50
ALB (g/dl)	15.113^{ab}	15.43^{ab}	14.54^{a}	17.30^{b}	14.85^{a}	15.45±0.43
GLO (g/dl)	28.45^{c}	26.62^{c}	18.90^{a}	19.14^{a}	25.56^{b}	23.74±2.25

TP= Total Protein, ALB= Albumin, GLO= Globulin, ALT= Alanine Transaminase, T=treatment

Values obtained in this experiment agree with data recorded by (10) for normal range of Total Protein for broilers. Variation in Total Protein could be attributed to an alteration in digestion capacity conferred by the pawpaw leaf meal present in the feed thereby making protein available to the birds. This is not in agreement with the findings of (11) whose research showed that the higher serum total protein value signifies better utilization of the protein content of the feed. Albumin was not significantly affected (P>0.05) across all treatments but significant difference was seen in Treatment 4. However, T4 (17.30) recorded the highest value. (12) reported that albumin helps to prevent haemorrhage. This therefore implies higher blood clotting ability with improved albumin content. Significant treatment differences (P<0.05) were observed for globulin. The highest value was recorded for T1 (28.45 g/dl) with an average of 23.74 g/dl. Globulin and albumin are very important components of total protein. Globulin is majorly implicated for the conferment of immunity in livestock (12). Values obtained for total protein and globulin though not significantly different (P>0.05) are within normal range of 30.16 g/l to 80.88 g/l and 1.05 g/dl to 6.40 g/dl respectively reported by (13) for healthy chicks. This implies that the chickens' immunity was not compromised at any of the levels of inclusion. Reports by other researchers indicated that provided the level of bitter leaf inclusion is within the tolerable range for birds, significant increase in the serum total protein and its derivatives are expected with an increase in the inclusion level of the bitter leaf in the diets of birds (11). ALT is found in the highest amount in the liver and is used to identify acute liver failures (14) as the enzyme is released into the serum immediately after hepatocellular damage. In this study, the ALT levels were not significantly affected (P>0.05) across all groups. This implies that the administration of pawpaw leaf meals may improve liver function at low concentration which may have resulted in lowering of ALT but may have opposite result at increasing concentration (15).

CONCLUSION AND APPLICATION

The result indicates that 6% levels of pawpaw leaf meals in diets of broiler chickens positively affect the hematological and biochemical parameters, influencing the health and wellbeing of the birds.

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