Effects Of Pawpaw (*Carica Papaya*) Leaf Meals on Haematological and Carcass Characteristics of Broilers

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K E Y W O R D S

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A B S T R A C T

This study was designed to investigate the effect of varying levels of pawpaw leaf meal (PLM) on haematological and carcass characteristics of broiler birds. Sixty broilers of five weeks old were used for study which lasted for five weeks. The birds were assigned to four treatment diets with three replicates. The finisher rations were formulated in which PLM was incorporated at 0.5%, 1.5% and 2.0% in T_2, T_3 and T_4 respectively. T_1 had no PLM and served as the control diet. The diets were isocaloric and isonitrogenous containing 2,850kcal ME/kg and 20% crude protein. At the end of the experiment, data collected on haematological and carcass characteristics were subjected to analysis of variance (ANOVA) a completely Randomized Design (CRD). Results showed that there were significant ($p < 0.05$) improvements on the haematological and carcass characteristics of birds fed the treatment diets. Birds on T_4 diets had ($p < 0.05$) better haematological profiles Hb (10.17%) and PCV (31%) as against the control diet of Hb (8.09%) and PCV (25.97%). The carcass characteristics of the birds followed similar trend in which T_4 had significant higher values of 2,168g and 73.90% for dressed weight and dressed % respectively. While T_1 (control) had the lowest values of 1,786g and 68.96% for dressed weight and dressed% respectively. It is concluded that incorporating 2.0% PLM (T_4) into the diets of broilers helped to improve the haematological responses.

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INTRODUCTION

High cost of feed arising from the general unavailability of feedstuff or high cost of feed ingredients especially protein sources have resulted in drastic decline in productivity and profitability for intensive broiler production system. This scenario has resulted in supply bottlenecks forcing an upsurge in the price of broiler products in Nigeria. It is in realization of the above that farmers and feed manufacturers are now adjusting their operations towards exploring locally available and cheap feedstuff (Bratte *et al*., 2011) that are not readily utilized by man and the industries and stand as the only viable alternative to conventional feed ingredients (Mohammad, 2021).

The proteins from the leaves may be recovered and fed to farm animals in form of leaf meal protein concentrates. Examples of the leaf meals which have been widely used in feeding non-ruminant animals include *Leucaena leucocephala, Azadirachyta indica, Gliricidia sepium, Carica papaya* and *Manihot esculenta* (Gadzirayi *et al*., 2012; Onyimonyi and Onu, 2009) and also provides some necessary vitamins, minerals and oxycarotenoids which cause yellow colour of broiler skin, shank and egg yolk (Onyimonyi and Onu, 2009; Esonu *et al.,* 2006). The only perceived constraints of using leaf meal are the presence of some phytochemicals and anti-nutrient factors commonly found in plants which could limit digestibility though these could be alleviated through different processing methods.

However, it becomes imperative to investigate the haematological indices of the broilers fed pawpaw leaf meal to further ascertain the safety of its use. Pawpaw plant has been identified and used in herbal applications and as ethnobotanical in feeding of finishing broilers (Onyimonyi and Onu, 2009). This research was therefore, designed to investigate the haematological and carcass characteristics of finishing broilers fed varying dietary levels of pawpaw leaf meal.

METHODOLOGY

Experimental Location and Animal Management

The experiment was conducted at the poultry unit of the Teaching and Research Farm of the Faculty of Agriculture, University of Nigeria, Nsukka. A total number of 60 broiler chicks of Anak strain were used for the experiment. The chicks were brooded in a deep litter system for four weeks and were transferred into individual pens measuring 4 x 5feets. Feed and water were provided ad-libitum with appropriate routine medications and vaccinations.

Preparation of Test Ingredients and Experimental Diets

The pawpaw leaves (*Carica papaya*) used for this experiment were harvested from the pawpaw trees plantation of the Department of Crop Science, University of Nigeria Nsukka. The leaves were harvested and dried at the greenhouse unit of the Department of Crop Science. The greenhouse has a temperature range of 30-40C in the afternoon but lower than this in the morning and evening hours. The pawpaw leaves were allowed to stay for 2-3 days at the greenhouse for it to dry to crispy while still retaining its greenish colouration the dried leaves were milled using the milling machine at the Department of Crop Science Analytical Laboratory to produce pawpaw leaf meals (PLM). The leaf meal was further subjected to proximate analysis to determine the crude protein content.

Experimental Design and Data Collection

The experimental design used was a completely randomized design (CRD). After brooding for four weeks, the birds were randomly allotted to the four (4) experimental groups with 15 birds each, replicated 3 times to give 5 birds per replicate. The treatment effect was estimated by comparing the means of the assessed parameters in the treated groups against the control.

At eight weeks old, one bird was randomly selected from each replicate, isolated, tagged and starved overnight. The blood samples were drawn for haematological tests from the jugular veins (Alcorn, 2002). The samples were taken in labeled sterile universal bottles containing ethylene diamine tetra-acetic acid (EDTA) and were used to analyze for full blood count.

Heamatological Determination

In heamatological determination, the Haemoglobin concentration (Hb) was determined using the method as described by Drabkin 1932 while Red blood cell (RBC) was determined using the methods as described by Sood, 2006. White Blood Cell (WBC), Packed Cell Volume (PCV), were determined using the method as described by Baker and Silverton (1985). Thereafter, the Mean Cellular Volume (MCV) Mean Cellular Haemoglobin Concentration (MCHC), and Mean Cellular Haemoglobin (MCH) were calculated from red blood cell. In carcass characteristics, the following parameters were collected; Live weight (g), Dressed weight (g), % Dressed weight, % Head weight, % Neck weight, % Breast weight, % Wing weight, % Thigh weight and % Shank weight,

Statistical Analysis

The data collected were subjected to analysis of variance (ANOVA) using SPSS version 21. Means were separated using Duncan's option as found in statistical package /software (Duncan, 1955)

Table 1. Percentage Composition of the Finisher Diets

Ingredients	T1(control)	T2(0.5%)	T3(1.5%)	T4(2.0%)	PLM
Cassava chips	40	40	40	40	--
Maize	7	7	7	7	--
Groundnut cake	25	24.5	23.5	23	--
Palm kernel cake	19	19	19	19	--
Pawpaw leaf meal	0	0.5	1.5	2.0	--
Fish meal	5	5	5	5	--
Bone meal	3	3	3	3	--
Salt	0.25	0.25	0.25	0.25	--
Lysine	0.25	0.25	0.25	0.25	--
Methionine	0.25	0.25	0.25	0.25	--
Vit premise	0.25	0.25	0.25	0.25	--
Total	100	100	100	100	--
Determined Analysis					
Moisture	12.20	11.00	12.80	10.20	10.20
Crude Protein	20.66	21.37	21.42	21.16	30.12
Crude Fibre	4.90	5.12	5.27	5.38	5.60
Ether Extract	1.10	1.20	2.0	1.40	1.20
Ash	10..03	10.02	1..49	10.62	8.45
Nitrogen Free Extract	52.01	51.29	48.52	51.99	44.43

Provided the following per kg of feed: vitamin A, 10,000iμ; vitamin D2, 2000iμ; vitamin E, 6iμ; vitamin K, 2mg; riboflavin, 4.2 mg; vitamin B12, 0.01mg; pantothenic acid, 5mg; nicotinic acid, 20mg; folic acid, 0.5mg; choline, 3mg; Fe, 20mg; Mg, 56mg; Cu, 1.0mg; Zn, 5.0mg; Co, 1.25mg; Iodine, 0.8mg.

Table 2: Haematological Indices of Broilers Fed Pawpaw (*Carica papaya*) Leaf Meal

Parameters	T1	T2	T3	T4	SEM
PCV (%)	25.97[b]	26.27[b]	29.97[a]	31.00[a]	0.40
Haemoglobin (g/100ml)	8.09[b]	8.48[b]	9.46[a]	10.15[a]	0.53
Red Blood Cell (mm^3)	3.43	3.97	4.23	4.27	0.21
Total WBC x $10^6 mm^3$	4.27[b]	4.50[b]	5.40[a]	5.37[a]	1.05
TWBCDIFF					
Neutrophils (%)	14.60	12.70	13.30	12.50	0.63
Monocytes (%)	4.10	4.80	4.60	4.30	0.21
Lymphocytes (%)	81.30	82.50	82.10	83.20	1.38
MCV (fl)	101.30[c]	112.10[b]	116.40[b]	125.40[a]	1.76
MCH (g/dl)	33.80	34.70	33.60	32.60	1.13
MCHC (%)	41.60	40.90	42.40	43.30	0.82

PCV = packed cell volume; MCV=mean corpuscular volume; MCH=mean corpuscular haemoglobin; MCHC= mean corpuscular haemoglobin concentration

Table 3: Carcass Characteristics of Broilers Fed Pawpaw (*Carica papaya*) Leaf Meal

Parameters	T1(Control)	T2(0.5%)	T3(1.5%)	T4(2.0%)	SEM
Live Weight (g)	2,600[c]	2,750[b]	2,800[b]	2,950[a]	1.27
Dressed weight (g)	1,786[c]	1,946[c]	1,986[b]	2,168[a]	1.72
Dressing %	68.69[c]	70.76[b]	70.93[b]	73.90[a]	0.89
Breast %	27.24	27.86	28.14	28.78	0.38
Thigh %	20.63	21.48	21.32	21.78	0.32
Wings %	7.13	7.64	7.79	7.91	0.14
Shank %	4.16	4.62	4.24	4.54	0.12
Head %	2.50	2.46	2.67	2.69	0.10

RESULTS AND DISCUSSION

Haematological Indices

The results of the haematological indices of the broilers were presented in table 2. Hb, PCV, WBC and MCV were significantly ($p < 0.05$) affected by the treatment groups. Birds on T4 and T3 had similar ($p > 0.05$) PCV values of 31.00% and 29.97% which were themselves similar but different ($p<0.05$) from the values of 25.97% and 26.27% reported on T1 and T2 respectively. However, Hb and WBC followed the same trend in which T4 and T3 had higher significant values than T1 and T2. In MCV, T4 had the highest value of 125.40fl which was significantly ($p<0.05$) different from T3 (116.40fl) and T2 (112.10fl) which were themselves similar but different from the value of T1 (101.30fl).

In carcass characteristics of broiler chickens fed varying levels of pawpaw leaf meal, significant differences exist on their live weight, dressed weight and dressing percentage. Birds on T4 had the highest live weight of 2950g which was significantly ($p<0.05$) higher than the T2 (2750g) and T3 (2800g) which were themselves similar but different from T1 (Control) which had the lowest value of 2600g. The dressed weight and dressing percentage followed the same trend in which T4 had the highest values of 2,168g and 73.90% respectively while T1 had the lowest values of dressed weight gain and dressing percentage of 1,786g; 68.69% respectively.

Haematological indices of an animal plays a vital role in determining the physiological conditions of the farm animal, by distinguishing normal state from state of stress which could be nutritional, environmental or physical. As a suitable guide, a PCV value above 56% indicates that the birds are dehydrated, while PCV value below 22% is an indication that the birds are anaemic (Pendl, 2001) In the present study, all the PCV values were within the normal value for the birds of their size and age (25-45%) (Al-Nedawi, 2018).

However, the significant increase in Hb and PCV and numerical increase in RBC counts of the broilers fed PLM are an indication that the oxygen-carrying capacity of the blood was improved (Napirah *et al*., 2013; Revsianto, 2016).

Thus, haemoglobin range of 7.04 to 13.0g/dl reported by (Putriani *et al*., 2012) corresponds with the value of 8.09g/dl to 10.17g/dl obtained in this present study. However, the values obtained from this present study were higher than the value of 6.85g/dl to 7.40g/dl reported by (Sugiharto *et al*., 2015) and 5.18 to 9.30g/dl as submitted by (Salam, *et al*., 2013).

An increased value of MCV MCH and MCHC levels is an indication that the birds are not undergoing any serious stressors (Huff, 2006). It can be inferred therefore that the PLM may have slightly increased the bird's ability to withstand stress. This view agrees

with the work of Esonu *et al*., 2006 who reported an improved performance of birds fed Neem (*Azadirachta indica*) leaf meal at different inclusion levels.

In carcass characteristics, the high breast percentage range of 27.24% -28.78% corresponds with the value obtained by (Egbunike *et al*., 2009) but higher than the value of 21.77% - 24.90% reported by (Oladimeji *et al.,* 2020). Likewise, the value of 27.24% -28.78% obtained in this current study was higher than the earlier values of 23.04% - 24.73% report by (Ogunwole *et al*., 2016) when fed ϐ carotene cassava grit-based diets.

Generally, T4 had superior values in all the carcass parameters obtained in this study and this is an indication that the PLM, may have positively influenced the carcass yield of broilers fed the treatment diets. Pawpaw leaf contains high crude protein percentage and also papain which may have aided in digestion and in the release of free amino acids resulting in better performance as in this study.

CONCLUSION

Broiler finisher diet can be supplemented with pawpaw leaf meal at 2.0% with no adverse effects on haematological parameters and carcass characteristics. The positive influence of pawpaw leaf meal justifies the practice of using them in broiler production to help improve the health and general wellbeing of broiler chickens. It also aided in cost reduction and increased profit margins as a protein supplement in finishing broiler diets judging from the increased carcass meat yield as observed from the birds fed the treatment diets.

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