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EVALUATION OF *Pterocarpus Mildbraedii* LEAF MEAL SUPPLEMENTS ON PERFORMANCE, BLOOD PROFILE AND ORGAN MORPHOLOGY OF BROILER CHICKENS

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Abstract

The study was conducted to evaluate the utilization of varying levels of *Pterocarpus mildbraedii* leaf meal (PMLM) by broiler chickens. A total of 150 Arbor Acre day old chicks were acquired and subjected to a feeding trial for 4 weeks. The effects of PMLM were measured on growth performance, blood parameters and organ morphology of broiler chickens. The birds were randomly assigned to 5 dietary treatments: 0.1%PMLM, 0.2%PMLM, 0.4% PMLM, 0%PMLM with antibiotics (control) and 0%PMLM without antibiotics (control). Treatments composed of 3 replications at 10 birds per replicate. The experimental design used was Completely Randomised Design (CRD). Results indicated that inclusion of PMLM inclusion did not significantly influence ($p>0.05$) the performance characteristics (body weight, weight gain, feed intake and feed conversion ratio). The inclusion of the supplements did not also significantly affect ($p>0.05$) all the haematological parameters measured except platelets where birds fed 0.2%PMLM supplements had significantly higher ($p<0.05$) value (148.25 ± 12.15) when compared to other treatments. Birds fed 0.2%PMLM supplements had significantly higher ($p<0.05$) values for albumin and globulin (1.91 ± 0.07g/dL and 0.83 ± 0.56g/dL respectively) but no significant difference ($p>0.05$) was recorded for glucose, total protein and creatinine. The supplementation did not also significantly affect ($p>0.05$) the weights of heart, spleen and liver but significant difference ($p<0.05$) was observed for the gizzard, small and large intestines. The use of PMLM in the diets of broiler chickens up to 0.4% supplementation level could be effectively utilized without any deleterious effect and for optimum performance.

Keywords: Antibiotic, Haematology, Phytobiotic, Serum biochemistry, Utilization.

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INTRODUCTION

The demand for animal products (egg and meat) in under-developed and developing countries of the world is on the rise, and this pattern is anticipated to continue over the years. According to FAO (2015), Nigerians consume less animal protein as against its recommended value of 35 g of animal protein per day. This deficit in animal protein consumption among Nigerians and as well as other developing countries could be mitigated through the production of animals with short generation interval (Jiwuba *et al.,* 2016) such as broilers.

Also, the production of healthy poultry birds with quality meat and eggs without harmful residues, within a short time interval is another source of concern to modern poultry farmers. The frequent use of synthetic drugs such as growth promoters has high cost implications, and sometimes, with attending adverse side effect on bird's health, prolonged withdrawal period and risk of accumulation in tissues and egg which could have harmful effects on human health (Jawad *et al.*, 2014).

Pterocarpus mildbraedii leaves locally known as "Oha" in Eastern Nigeria are used as vegetables in the preparation of soup. *Pterocarpus mildbraediiHarms* is a green leafy vegetable which grows more like a big tree reaching a height of about 2m (6.6ft) and also having stem diameter of about20m (0.79 inch). *Pterocarpus mildbraedii Harms* has a smooth, grey or pale brown bark, exuding red gum once cut. Two species are recognized locally *Pterocarpus mildbraedii Harms* (Oha) and *Pterocurpus santalinoides* (Uturukpa) (Uchegbu *et al.*, 2015). Some tribes in Eastern and Southern Nigeria usethe leaf extracts from *Pterocarpus mildbraedii* in the treatment of headaches, fever, convulsions, pains, and respiratory disorders and as antimicrobial agents (Ogukwe *et al.*, 2004). Aside from the leaves being consumed by humans as vegetables, livestock also browse on them. Other uses include timber, resin or gum and dyes production (Keay, 1989) as well as analgesia from the bark (Akinyeye *et al.*, 2010).

Akintunde et al. (2022) found in their study that the leaf of *Pterocarpus mildbraedii* dry matter (74.20%), ash (6.30%), crude fiber (4.60%), crude protein (1.05%), crude fat (4 .60%) and ash (7.33%) and nitrogen-free extract (81.83%). The phytochemical study revealed that the leaf of *Pterocarpus mildbraedii* contained saponin (23.24 mg/100 g), alkaloid (12.58 mg/100 g), hydrogen cyanide (0.36 mg/100 g) and tannin (95.79 mg/100g) (Akintunde et al., 2022). The mineral and vitamin analyses showed that the leaves of *Pterocarpus mildbraedii* contain macrominerals such as calcium (0.33%), magnesium (0.22%), potassium (0.15%), sodium (0.04%), microminerals (mg /kg) such as manganese (55.29) and iron (749.22) and high content of vitamins A 3528 IU/kg), B1 (2.03 mg/100 g), B2 (0.93 mg /100 g), B3 (4. 62 mg/100 g), B6 (2.23 mg/100 g), B12 (1. 77 mg/100 g) and C (12. 58 mg/100 g) (Akintunde et al., 2022). Akintunde et al. (2022), however, concluded that the leaves of *Pterocarpus mildbraedii* are of high nutritional quality, particularly in terms of carbohydrates, minerals (as indicated in ash content), micro and macro-minerals, and vitamins, but are low in

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crude protein. However, they reiterated that given the high tannin content, a certain degree of caution should be exercised when including it the monogastric diet.

Pterocarpus mildbreadii is widely recognized as important indigenous multipurpose tree with very high commercial and nutritional values in most ecological zones of Nigeria used mainly as vegetable in soups and herbs however, there is paucity of information on the use of this plant leaf in broiler chickens utilization especially on its potentials as possible replacements for antibiotics. This study is aimed at determining the effects of African rosewood leaf (*Pterocarpus mildbradii*) leaf meal on haematological, serum biochemical profile and organ morphology of broiler chickens.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Teaching and Research farm of the Department of Agriculture and Industrial Technology, Babcock University, Ilishan-Remo, Ogun State. Ilishan-Remo is in the rain forest of South Western Nigeria with mean rainfall of 2400mm. Ilishan is in the south west geo-political zone of Nigeria and falls on latitude of 6'54N from the equator and Longitude 3'42'E from the Greenwich Meridian and the mean annual temperature is about 27^0C.

Sourcing and Preparation of Experimental *Pterocarpus mildbradii* Leaf Meal

Pterocarpus mildbradii leaves were purchased from the market in Arena, Oshodi, Lagos, Nigeria. The leaves were air-dried to remove moisture and then minced into a coarse texture. Five diets were formulated and compounded for the experiment with various inclusion levels of *Pterocarpus mildbradii*, except the positive control group which contained the antibiotic feed additives. The ground *Pterocarpus mildbradii* was thoroughly mixed with the feed at the rate of 100g, 200g, 400g, 0.0g and 0.0g per 50kg bag of experimental feed. They are as follows:

T1- 0.1% of *Pterocarpus mildbradii* leaf meal (PMLM)

T2 - 0.2% of *Pterocarpus mildbradii* leaf meal

T3 - 0.4% of *Pterocarpus mildbradii* leaf meal

T4 (+Control) - 0.0% of *Pterocarpus mildbradii* leaf meal with Enrofloxacin antibiotics (oral) and it was taken with water at 0.3g for 4 litres of water.

T5 (-Control) - 0.0% of *Pterocarpus mildbradii* leaf meal without antibiotics (oral)

Experimental Birds Procurement

A total of 150 Arbor Acre Broiler chicks were procured from a reputable hatchery and nurtured for 28 days. Feed and water were provided *ad-libitum.* The birds were randomly assigned into five dietary treatments with three (3) replicates. The experimental design used was Completely Randomised Design (CRD).

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Management of Experimental Birds

Housing

The cages were washed and disinfected using a disinfectant and left to rest for two weeks prior to the arrival of the chicks. Before the arrival of the birds, the brooding cages were ready and water was waiting for them upon arrival.

The experimental diet was analyzed for crude fibre, crude protein, ether extract, nitrogen free extract and ash according to the methods of the Association of Official Analytical Chemists (1990). Dry matter was determined by drying at 105^0C until constant weight.

Table 1: Gross Composition of Experimental Diets

INGREDIENTS (%)	TREATMENTS				
	T1 0.1% PMLM	**T2 0.2% PMLM**	**T3 0.4% PMLM**	**T4 0.0% PMLM**	**T5 0.0% PMLM**
Maize	57.50	57.50	57.50	57.50	57.50
Soybean Meal	34.50	34.50	34.50	34.50	34.50
Pterocarpus mildbradii leaf meal	0.10	0.20	0.40	0.00	0.00
Wheat Offal	3.00	2.90	2.70	3.10	3.10
Vegetable Oil	1.00	1.00	1.00	1.00	1.00
Bone Meal	2.00	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methoine	0.20	0.20	0.20	0.20	0.20
Limestone	1.50	1.50	1.50	1.50	1.50
Tox-nil	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00

Data Collection

Data was collected on the performance parameters (Feed intake, Body weight gain) while feed conversion ratio (FCR) and livability of broiler chickens were calculated. The experiment lasted for 28 days and data collected weekly. Data collected on performance characteristics are as follows:

Feed intake

The left-over of feed supplied were collected, weighed and the values recorded were subtracted from the initial feed offered to ascertain the feed intake.

Feed intake (g) – feed given (g) – left-over feed (g)

Body Weight Gain

The weights of three (3) birds in each replicate of each treatment were weighed at the beginning of the experiment and their weights recorded. The weekly weight gains of experimental bird were recorded on a weekly basis by subtracting the values of initial body weight in grams from final body weight.

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Feed Conversion Ratio

This is the amount of feed consumed needed to produce 1kg of meat by the birds. This value was obtained by dividing the average feed intake by the average weight gain.

$$\text{Feed Conversion Ratio (FCR)} = \frac{\text{Feed intake (g)}}{\text{Weight gain (g)}}$$

Liveability (Mortality)

Mortality was recorded against the respective replicates and when they occurred throughout the experimental period. Percentage liveability was calculated as;

$$\text{Percentage liveability (\%)} = \frac{\text{Number of live birds x 100}}{\text{Number of birds per treatment}}$$

Blood Collection, Haematology and Serum Metabolites Analysis

At the 28^{th} day of feeding trials, two (2) birds from each dietary replicate were randomly sampled to determine haematological and serum biochemical responses. 5ml of blood were taken from the jugular vein of randomly selected birds per replicate. 2.5ml of sampled blood were put into labelled blood sample bottles containing anti-coagulant (Ethyl Diamine-Tetra-Acetate powder (EDTA)) to determine haematological parameters. Parameters analysed include; Packed Cell Volume Haemoglobin (WI). Red Blood cells, White Blood cell, Lymphocytes (0/0), Platelets, Monocytes (%), Eosinophil and Basophils (%) according to the procedure of Howlett and Jamie (2008). The remaining 2.5ml of sampled blood were put into a well labelled sterile blood sample bottles without anti-coagulant to determine serum biochemical parameters - Glucose (mg/dl), Total Protein (g/dl), Albumin (g/dl), Globulins, Urea and Creatinine (mg/dl).

Organ Morphology of birds fed with Pterocarpus Milbraedii

At the end of the experiment, six birds were randomly selected from each treatment, two (2) per replicate for organ morphology. The selected birds were starved overnight and their fasted live weights were recorded. Birds were slaughtered by bleeding the jugular vein according to Ojewola and Longe (1999). Afterwards, they were defeathered and eviscerated. The weights of their internal organs were taken. The following parameters were recorded: liver, spleen, gizzard, heart, small intestine and large intestine.

Statistical Analysis

Significant treatment means were subjected to analysis of variance (ANOVA) statistical analysis system package SAS (2002) and differences in means were separated using Duncan Multiple Range Test (Duncan, 1955).

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RESULTS

Table 2: Performance Characteristics of broiler chickens fed *Pterocarpus mildbraedii* leaf meal based diets

Parameters	T1 0.1% PMLM	T2 0.2% PMLM	T3 0.4% PMLM	0.0%PMLM + Antibiotics	T5 0.0% PMLM
Initial weight (g)	108.90 ± 0.62	110.73 ± 0.39	108.70 ± 1.54	109.43 ± 1.93	110.40 ± 0.57
Total weight gain (g)	1032.60 ± 33.66	991.43 ± 53.11	969.93 ± 43.09	1012.77 ± 58.08	966.27 ± 26.68
Final weight(g)	1077.67 ± 33.66	1036.50 ± 53.11	1015.00 ± 43.09	1057.83 ± 58.08	1011.33 ± 26.68
Feed intake(g)	743.06 ± 31.19	748.81 ± 31.64	756.56 ± 32.40	754.22 ± 31	748.26 ± 31.88
FCR	0.69 ± 0.01	0.72 ± 0.01	0.75 ± 0.00	0.71 ± 0.01	0.74 ± 0.01

Livability

In this experiment, livability was 100% as there was no mortality throughout the period of study. Table 2 shows the performance characteristics of the experimental birds. The supplementation of PMLM did not significantly ($p>0.05$) affect the performance characteristics of the broiler chickens.

Table 3: Haematological Responses of Broiler Chicken Fed PMLM Supplemented Diet

	0.1%PMLM	0.2%PMLM	0.4%PMLM	0.0%PMLM + Antibiotics	0.0%PMLM
PCV (%)	29.17 ± 0.98	26.75 ± 1.75	28.33± 2.33	27.83 ± 0.79	26.83 ± 0.79
Hb (g/dL)	9.45 ± 0.30	8.63 ± 0.55	9.03 ± 0.73	9.05 ± 0.21	8.68 ± 0.2
RBC ($x10^6$)	3.08 ± 0.09	2.44 ± 0.47	2.69 ± 0.56	2.84 ± 0.06	2.86 ± 0.07
WBC ($x10^6$)	15541.00 ± 507.18	14487.50 ± 461.60	14800.00 ± 860.72	15075.00 ± 428.71	15050.00 ± 438.94
PLATELETS	124.00 ± 5.05[a]	148.25 ± 12.15[b]	125.33 ± 4.10[a]	121.00±4.78[a]	111.83 ± 3.41[a]
LYM (%)	61.00 ± 0.97	59.75 ± 3.66	63.67 ± 3.38	57.50 ± 1.84	57.83 ± 1.78
HET (%)	31.50 ± 1.23	33.25 ± 4.25	30.33 ± 3.28	36.00. ± 1.98	34.83 ± 2.26
MON (%)	3.33 ± 0.33	3.25 ± 0.75	3.33 ± 0.88	2.83 ± 0.40	3.5 ± 0.43
EOS (%)	3.83 ± 0.40	3.75 ± 0.63	4.33 ± 0.88	3.5 ± 0.67	3.67 ± 0.61
MCH (%)	3.07±0.07	3.48±0.46	3.62±0.64	3.18±0.03	3.04±0.07
MCHC (%)	32.42±0.3	32.27±0.63	31.89±0.64	32.55±0.35	32.38±0.39
MCV	9.47±0.18	10.79±1.47	11.35±1.98	9.78±0.12	9.39±0.14

[a b c]Means on the same row with different superscripts are significantly different ($P<0.05$). Legends- Packed Cell Volume (PCV), Haemoglobin (Hb), Red Blood cells (RBC), White Blood Cells (WBC), Lymphocytes (LYM), Heterocytes (HET), Monocytes (MON), Eosinophil (EOS), Mass Corpuscular Heamoglobin (MCH), Mass Corpuscular Haemoglobin Concentration (MCHC) and Mass Corpuscular Volume (MCV).

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Table 4: Serum Biochemical Responses of Broiler Chicken Fed PMLM Supplemented Diet

	0.1%PMLF	0.2% PMLF	0.4% PMLF	0%PMLF	0%PMLF + ANTIBIOTIC
Glucose (mg/dL)	308.53 ± 10.72	306.56 ± 13.79	305.41 ± 9.96	299.08 ± 9.11	295.60 ± 14.17
Total Protein (g/dL)	2.32± 0.08	2.67 ± 0.23	2.11 ± 0.15	2.40 ± 0.13	2.71 ± 0.24
Albumin (g/dL)	1.85 ± 0.08^{c}	1.91 ± 0.07^{c}	1.77 ± 0.07^{bc}	1.59 ± 0.03^{ab}	1.5 ± 0.1^{a}
Globulin (g/dL)	0.37 ± 0.15^{ab}	0.83 ± 0.56^{ab}	0.21 ± 0.24^{a}	0.81 ± 0.14^{ab}	1.21 ± 0.25^{b}
Creatinine (mg/dL)	0.82 ± 0.07	0.95 ± 0.06	0.83 ± 0.03	0.93 ± 0.05	0.83 ± 0.07

$^{a\,b\,c}$Means on the same row with different superscripts are significantly different (P<0.05).

Table 3 shows the values of the haematological responses of the experimental birds. No significant differences (p>0.05) were observed in the parameters measured but platelet was significantly influenced (p<0.05) by the supplementation.

Table 4 shows the values of the serum biochemical response of the experimental birds. All the values obtained for the serum biochemistry were not significantly different (p>0.05) except for albumin and globulin that were significantly affected (p<0.05) by PMLM supplementation.

Table 5: Gut Morphology of Broiler chickens fed varying levels of *Pterocarpus mildbraedii* leaf meal based diets

Parameters (g)	T1	T2	T3	T4	*T5*
Gizzard	60.50 ± 5.50^{ab}	53.00 ± 6.00^{ab}	45.00 ± 1.00^{a}	67.00 ± 7.00^{b}	59.00 ± 1.00^{ab}
Heart	8.50 ± 0.50	8.00 ± 1.00	8.00 ± 1.00	7.50 ± 0.50	8.00 ± 0.00
Spleen	1.00 ± 0.00	1.50 ± 0.50	1.50 ± 0.50	1.00 ± 0.00	1.00 ± 0.00
Liver	39.50 ± 1.50	33.00 ± 5.00	30.00 ± 3.00	30.00 ± 1.00	30.50 ± 3.50
Large Intestine	58.00 ± 28.00^{ab}	65.00 ± 1.00^{ab}	72.00 ± 1.00^{b}	23.00 ± 2.00^{a}	66.00 ± 6.00^{ab}
Small Intestine	60.50 ± 16.50^{b}	32.00 ± 8.00^{ab}	19.00 ± 5.00^{a}	27.50 ± 2.50^{a}	43.00 ± 1.00^{ab}

abc: means in the same horizontal row with different superscripts are significantly (P>0.05) different.

Table 5 shows the gut morphology of the broiler chickens. The gut morphology measured showed that birds in T3 with 0.4% *pterocarpus mildbradii* had significantly highest (p<0.05) weight of large intestine with 72g and birds in the control diet T5 with no PMLM supplement and no antibiotics had significantly smallest (p<0.05) weight of large intestine with 27.5 g. The size of the heart and spleen were not significantly different (p>0.05) among the treatments

The birds in T5 with no PMLM supplement and antibiotics had significantly largest (p<0.05) weight of gizzard with 67g and the birds fed 0.4% PMLM supplement had significantly smallest (p<0.05) weight of gizzard with 45g.

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Table 6: Relative Organ Weight of birds fed varying levels of *pterocarpus mildbradii* leave meal based diets

Organs (g)	1	2	3	4	5
Gizzard	6.34 ± 0.22^{b}	5.84 ± 0.19^{ab}	5.62 ± 0.25^{ab}	5.12 ± 0.19^{ab}	4.43 ± 0.27^{a}
Heart	0.71 ± 0.21	0.79 ± 0.25	0.79 ± 0.25	0.77 ± 0.20	0.79 ± 0.26
Spleen	0.10 ± 0.00	0.10 ± 0.01	0.09 ± 0.00	0.15 ± 0.01	0.15 ± 0.02
Liver	2.84 ± 0.03	3.02 ± 0.10	3.67 ± 0.14	3.19 ± 0.13	2.96 ± 0.05
Large Intestine	0.02 ± 0.00^{a}	6.53 ± 0.71^{ab}	5.39 ± 0.80^{ab}	6.27 ± 0.70^{ab}	7.09 ± 0.80^{b}
Small Intestine	2.60 ± 0.11^{ab}	4.25 ± 0.30^{ab}	5.62 ± 0.25^{b}	3.09 ± 0.15^{ab}	1.87 ± 0.22^{a}

^{abc}: means in the same horizontal row with different superscripts are significantly (P>0.05) different.

Table 6 shows the relative organ weight of the birds fed varying level of PMLM. There was no significant differences (p>0.05) observed in the heart, spleen and liver of the birds fed varying inclusion levels of *Pterocarpus mildbradii* leaf meal based diet. However, the size of heart range from 0.71g - 0.79 g while that of the liver range from 2.8g - 3.6g. The values obtained for the gizzard, large intestine and small intestine were significantly different (p<0.05) among the treatments.

DISCUSSION

There was no significant difference (p>0.05) in the average feed intake, with the highest quantity of feed intake consumption happening with the birds in T3 with 0.4% *Pterocarpus mildbradii* at 756.56g and the least consumed were the birds in T1 with 0.1% *Pterocarpus mildbradii* at 743.06 g. The similarity in feed intakes of the birds are in line with the finding of Bozkurt *et al.* (2012) who observed that inclusion of the natural herbal growth promoters in broiler ration did not improve feed consumption but in contrast with the findings of Lynn and Truc (2010) and Onu *et al.* (2019) who reported significant increment in feed intake of birds, fed diets containing ginger; which they attributed to the improvement in appetite and flavor as a result of ginger meal inclusion and significant reduction was observed in feed intake of birds fed *Moringa oleifera* seed meal and *Chromolaena odorata* leaf meal as reported by Akintunde and Toye (2014) and Akintunde *et al.* (2021a) respectively. The average daily weight gain and the final live weight showed similar trend with feed intake as both parameters were not significant. This was however in contrast with the observations of Borazjani - Zadeh *et al.* (2011) and Onu *et al.* (2019) who observed improvements in final live weight and average weight gain of birds in diets with ginger. The zero mortality observed with birds in this study could be due to the fact that *Pterocarpus mildbradii* has potential as antibiotics, antioxidant, antifungal, antiviral agent and its potential to improve the immune system (Lim and Murtijaya, 2017), hence improve the liveability of birds. The non-significance (P>0.05) observed in the performance indices studied could be attributed to the nutritive value of *Pterocarpus mildbradii* leaf meal. Hematological indices had been recognized as one of the indicators for assessing the health status of animals (Oloruntola *et al.*, 2016; Akintunde *et al.*, 2019). There was no significant difference (P>0.05) between the haematological parameters of birds fed

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experimental diets. The Packed Cell Volume percentages ranged from 26.83 — 29.17 with treatment 2 having the lowest value (26.83) and treatment 3 recording the highest value (29.17). Haemoglobin ranged from 8.63 — 9.05, White Blood Cells (10^3ul) value obtained ranged 14.48 — 15.54, Red Blood Cells (10^3ul) value ranged 2.44 - 3.08 while the percentage of Lymphocytes values ranged between 57.5 - 63.67. Neutrophils ranged between 26.50 - 29.17, Monocytes ranges 2.83 - 3.50, Eosinophil ranged from 3.50 - 4.33 and Basophils ranged from 0.17 - 0.67. According to Isaac *et al.* (2013), Packed cell Volume is involved in the transport of oxygen and absorbed nutrients. Increased packed Cell volume shows a better transportation and thus prevents anaemia (Coles, 1986).

There was no significant difference (P>0.05) between the serum biochemical parameters of birds fed experimental diets except for albumin and globulin values. The non-significant effect of experimental diets on the total protein of the birds indicates the ability of the diets to support production of these blood components. Total protein and creatinine contents have been shown to depend on the quantity and quality of dietary protein. (Iyayi and Tewe, 1998; Esonu *et al.,* 2001, Akintunde *et al.*, 2021b). The values obtained for albumin in this study were lower than the recommended value from Mitruka and Rawnsley (1977). The values of albumin results obtained in this study could result in poor blood clotting, birds can be prone to haemorrhages. The result obtained from the globulin obtained from the birds fed experimental diets ranging from 295.6 - 308.53g/dl although the concentrations are within the normal range reported for chicken (Mitruka and Rawnsley, 1977). From the results there is clear evidence that the test ingredient compared favourably in all serum biochemical indices evaluated. There was no significant difference (p>0.05) in relative heart weight, this however suggests that the inclusion of PMLM did not have effect on the oxygen supply and blood circulation (Khanyile, 2013; Akintunde *et al.*, 2021b). The increase in gizzard and intestinal weight can also increase the metabolic activities such as digestion, which might lead to increased demand for oxygen and blood circulation, however heart weights were not influenced significantly by the supplementation of PMLM. The results however was in contrast with the study of Agbede and Aletor (2003), who reported an increase in relative heart weight with increasing levels of *Glyricidia sepium* leaf meal. The leaf meal inclusion had no effect on the relative weight of the liver.

Hetland and Svihus (2001) and Akintunde (2018) reported that inclusion level of leaf meal has the influence of stimulating gizzard activity and increasing the volume of the gizzard when added into the diet. It is essential to determine the relationship of gizzard with inclusion level of *Pterocarpus mildbraedii*, since *Pterocarpus mildbraedii* is observed to have extremely too low crude protein and contains polyphenolic compound such as tannin, which in turn, suppresses broiler performance. There was a linear decrease in relative weights of the gizzard with increasing dietary level of *Pterocarpus mildbraedii* leaf meal. The decrease in relative gizzard weights with increasing levels of *Pterocarpus mildbraedii* could be associated with low fibre contents, which stimulates the decrease in muscular activities. The gizzard breaks down ingested feed by muscular action and higher dietary leaf meal would prone high thickening of the muscle (Onibi *et al*., 2008).

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CONCLUSION

This study reveals that African rosewood leaf (*Pterocarpus milldbraedii*) could be used in the diets of broiler chicken at 0.4% supplementation level without any deleterious effects and for optimum performance.

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