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PERFORMANCE CHARACTERISTICS, HAEMATOLOGY AND SEROLOGICAL PROPERTIES OF BROILER CHICKENS FED DIETS SUPPLEMENTED WITH *TALINUM TRIANGULARE*

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ABSTRACT

The utilization of unconventional feed resources in broiler production as a means of reducing costs associated with feed has been continually explored over the years. Nevertheless, there is a dearth of information on the use of wilted waterleaf (*Talinum triangulare*) in this regard. Thus, this trial which lasted for 6 weeks was conducted to evaluate the effect of supplementing a basal diet formulated to meet the requirement of the broiler chicken with varying levels of wilted waterleaf (WL) at 0 g/kg, 5 g/kg and 10 g/kg. One hundred and fifty (150) day-old Arbor Acre broiler chickens were randomly allotted to 3 dietary treatments (T1: 0 g/kg, T2: 5 g/kg, and T3: 10 g/kg) with 5 replicates per treatment and 10 birds per replicate in a Completely Randomized Design (CRD). Results obtained revealed that birds fed diet T3 had the highest final weight and weight gain. Feed conversion ratio was statistically similar for both diet T2 (1.69) and T3 (1.67) compared to diet T1 which had the highest feed conversion ratio (1.71). Haematological parameters showed that only mean corpuscular volume, mean corpuscular haemoglobin, lymphocyte and granulocytes were significantly ($p < 0.05$) influenced by dietary treatments while others were unaffected. There were no significant ($p > 0.05$) differences among all serum biochemical indices evaluated. The results obtained from this study suggested that supplementing broiler chicken diets up to 10 g/kg waterleaf can significantly improve performance and haematological parameters and could be adopted by broiler farmers for maximum productivity of farms.

Key words: arbor acre broiler; water leaf; unconventional materials; husbandry; animal nutrition

INTRODUCTION

The poultry sector is an indispensable part of the livestock industry, however, feed and feeding account for a wholesome 60 – 75 % of production budgets when conventional feedstuff is utilized (Mmadubuike and Ekenyem, 2001; Mak *et al.*, 2022). The continuous exploration of alternative feed sources to formulate least-cost rations which will not alter production performance of the birds while at the same time ensuring that profit is maximized has been positioned as a response to the increasing cost associated with conventionally utilized feed sources (Nworgu *et al.*, 2014). However, to fully realize viable alternatives to traditional feed sources, researchers affirm that qualities such as cost-effectiveness, ease of processing, reduced/zero cost of processing, ready availability and sourcing, and the absence of food-feed controversy must be attributable to whatever will be termed a viable alternative feed source (Akande *et al.*, 2007; Ayeni *et al.*, 2022).

The tropical regions are characterized by abundance of vegetations among which are phytogenic plants, roots and green leafy vegetables (Adegbenro *et al.*, 2012). Fasuyi (2006) opined that these vegetations possess qualities attributable to materials which are viable alternatives to conventional feed sources. Amongst these,

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there is the waterleaf (*Talinum triangulare*), an underutilized indigenous naturally occurring vegetable with almost a year-round availability, in most cases 9 months. Nworgu *et al.* (2014) highlighted the importance of waterleaf in the food supply of many rural households, thus underscoring the resourcefulness of this vegetable. Nutritionally, waterleaf has been observed to contain good amount of crude protein (28.82 – 32.22 %), crude fibre (8.50 – 9.30 %), ash (2.46 – 3.26 %), nitrogen-free extractives (1.38 – 2.18 %), dry matter (19.55 – 23.15 %) and carbohydrate (55.34 – 56.54 %) (Adekanmi *et al.*, 2020). Additionally, Aja *et al.*, (2010) and Ikechukwu *et al.*, (2017) outlined the low levels of antinutrients in waterleaf while reporting beneficial compounds such as vitamin C, vitamin E, omega-3 fatty acids, soluble fibres (pectin), carotenoids (β-carotene), flavonoids and alkaloids. Mineral contents of WL presented by Agunbiade *et al.* (2015) include potassium (156.60 mg/100 g), phosphorus (196.50 mg/100 g), sodium (80.60 mg/100 g), zinc (10.50 mg/100 g), iron (0.65 mg/100 g), copper (0.12 mg/100 g). Thus, waterleaf has nutritional potentials that require full exploration both in human and livestock nutrition as it can be a source of enhancing well-being of both humans and animals. Utilizing waterleaf can consequently reduce feed costs and improve feed conversion and the health status of birds (Nworgu *et al.*, 2014). Therefore, this research is focused on evaluating the growth performance, blood haematological and serum composition of broiler chickens in relation to diets supplemented with wilted waterleaf.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Broiler section of the Teaching and Research Farm, The Federal University of Technology Akure, Ondo State Nigeria. The farm is sited within the latitude 7.491780°N, longitudes 4.944055°E and 5.82864°E, with an annual temperature range of 27 ° to 38 °C and annual precipitation between 1300 and 1650 mm (Daniel, 2015).

Sourcing and preparation of experimental diet

Fresh water leaves were sourced within the university (Federal University of Technology, Akure) environment, cleaned and allowed to wilt overnight to reduce moisture content and chopped before incorporation at graded levels into the basal diet. The proximate and mineral composition of the utilized waterleaf is presented in Table 1. A basal diet was formulated to meet the National Research Council (NRC, 1994) requirement for broiler chicken at both starter and finisher phases of the experiment. The basal diet was then divided into 3 portions with the addition of WL at 0, 5 and 10 g/kg feed and designated as T1, T2 and T3, respectively. The gross compositions of the experimental basal diet for both starter and finisher phases are presented in Table 2. Additionally, Table 3 and Table 4 shows the proximate composition of the experimental diets (basal diets + supplementation at 5 g/kg and 10 g/kg) at the starter and finisher phases of the trial.

Table 1. Proximate and mineral composition of wilted waterleaf

Parameter	T1 (control)
Dry matter (%)	23.15
Crude protein (%)	29.60
Crude fibre (%)	8.59
Nitrogen free extracts (%)	2.45
Calcium (mg/100 g)	90.18
Phosphorus (mg/100 g)	167.96
Potassium (mg/100 g)	149.75
Sodium (mg/100 g)	85.72

Experimental layout and birds' management

One hundred and fifty (150) day-old arbor acres broilers were sourced from a reputable hatchery in Ibadan, Oyo state, Nigeria. The birds were randomly allotted to the three dietary treatments (T1, T2, and T3) with 5 replicates with 10 birds in each in a completely randomized design (CRD) experiment. The birds were served test diets and water on ad lib basis. During the course of the experiment, all daily and occasional management practices were put in place.

Data collection

Performance evaluation: The average initial weight was measured and recorded at the onset of the experiment. Weekly feed intake and weight change were measured and recorded to evaluate the feed intake, weight gain and feed conversion ratio (FCR). The daily feed intake (DFI) was measured by obtaining the differences between feed given and leftover feed on a daily basis. On the other hand, the daily weight

Table 2. Gross composition of the experimental basal diet of broiler chickens fed with varying levels of wilted waterleaf (starter phase and finisher phase)

Ingredient (kg)	Starter phase	Finisher phase
Maize	55.00	58.00
Ground nut cake	21.00	15.00
Soya bean meal	17.00	18.00
Wheat offal	0.00	6.00
Fish meal	4.00	1.00
Bone meal	1.25	1.25
Lysine	0.50	0.50
Methionine	0.75	0.75
Salt	0.25	0.25
Premix	0.25	0.25
Total	100.00	100.00
Calculated analysis		
Crude Protein (%)	22.21	21.08
Metabolizable energy (kcal/kg)	3015.15	3013.03
Crude Fibre	4.29	3.76
Calcium (%)	1.39	1.34

gain was obtained by dividing the total weight gain by numbers of days.

Mathematically, the DFI and FCR were calculated as:

DFI = Feed given – Leftover

FCR = Feed Intake/Weight Gain

Blood collection: On day 42 of the experiment which signaled the end of the trial, two (2) birds were selected from each replicate representing a total of ten (10) birds per treatment and bled through the jugular veins under standard procedures. Ten (10) ml of blood was collected from each of the birds into plain bottles for serum biochemical analysis while 5 ml of blood was collected into an EDTA plastic tube for evaluation of haematological parameters.

Laboratory analysis

Proximate analysis of experimental diets: The experimental diets were analyzed for proximate components such as dry matter (DM), crude protein (CP), crude fibre (CF) and nitrogen free extracts using standard procedures prescribed by the Association of Official Analytical Chemists (AOAC, 2012). Metabolizable Energy (ME) was calculated using the formula described by Peuzenga (1985) as:

ME (kcal/kg DM) = (37 x % CP) + (81.8 x % EE) + (35.5 x % NFE)

Haematological and serum biochemical Analysis: Dacie and Lewis (1991) described the method, which was used to assay packed cell volume (PCV), Hb count, red blood cell (RBC) and white blood cell (WBC) counts, mean corpuscular haemoglobin (MCH), mean corpuscular volume (MCV), mean corpuscular haemoglobin concentration (MCHC), lymphocyte and monocyte. The BIOBASE automatic biochemistry analyser (Biobase Biodusty (Shandong, Co., Ltd, China) was used to measure levels of creatinine, aspartate aminotransferase (AST), alanine aminotransferase (ALT), cholesterol, total protein, albumin and globulin.

Statistical analysis: Data obtained were subjected to One-way Analysis of Variance (ANOVA) using SPSS version 23.0 (SPSS Software products, Marketing Department, SPSS Inc Chicago, IL, USA). Where significant differences existed, Duncan Multiple Range Test (DMRT) of the same package was used to separate the mean values.

RESULTS

Proximate composition of experimental diets (starter phase) supplemented with varying levels of dietary wilted waterleaf

The proximate composition of the experimental diets used at the starter phase is shown in Table 3. All parameters evaluated were not significantly ($p > 0.05$) influenced by the addition of dietary wilted WL with the exception of crude protein, crude fibre, nitrogen free extracts, calcium and metabolizable energy. The dry matter content ranged from 94.34 – 95.41 %, crude protein, crude fibre, nitrogen free extracts, calcium and metabolizable energy obtained ranged from 22.56 – 22.83 %, 4.23 – 4.51 %, 74.10 – 76.40 %, 1.43 – 1.48 and 3023.54 – 3090.03 kcal/kg, respectively, and their values were observed to increase with the increasing dose of WL.

Proximate composition of experimental diets (finisher phase) supplemented with varying levels of dietary wilted waterleaf

Table 4 presents the proximate composition of the experimental diets used at the finisher phase of the experiment. The evaluated parameters were not highly ($p > 0.05$) influenced by the addition of dietary wilted WL except crude protein, crude fibre, nitrogen free extracts, calcium and metabolizable energy. The dry matter content ranged from 93.15 – 93.65 %, crude protein, crude fibre, nitrogen free extracts, calcium and metabolizable energy obtained ranged from 21.42 – 21.67 %, 3.27 – 3.60 %, 72.32 – 74.28 %, 1.54 – 1.59 % and 3003.03 – 3052.15 kcal/kg, respectively, which were observed to increase with increased supplementation of diet with WL from T1 to T3.

Performance characteristics (weeks 1 – 6) of broiler chicken fed varying levels of dietary wilted waterleaf

Table 5 shows the effect of WL addition on the performance (week 1 – 6) of broiler birds. Body weight gain, final weight, daily weight and feed conversion

Table 3. Proximate composition of experimental diets containing varying levels of wilted waterleaf fed to broiler chicken (starter phase)

Parameter (%)	T1 (control)	T2 (5 g/kg)	T3 (10 g/kg)	SEM	P-value
Dry matter	95.41	94.38	94.34	0.18	0.07
Crude protein	22.56[c]	22.65[b]	22.83[a]	0.40	0.02
Crude fibre	4.23[c]	4.45[b]	4.51a	0.13	0.08
Nitrogen free extracts	74.10[c]	75.44[b]	76.40[a]	0.33	0.01
Calcium	1.43[c]	1.46[b]	1.48[a]	0.01	0.03
Phosphorus	0.72	0.73	0.73	0.01	0.06
Methionine	0.45	0.45	0.44	0.00	0.07
Lysine	1.05	1.02	1.03	0.00	0.06
Metabolizable energy (kcal/kg)	3023.54[c]	3055.06[b]	3090.03[a]	9.60	0.02

[abc] Means significant ($p < 0.05$) difference within row; SEM: Standard Error of Mean.

Table 4. Proximate composition of experimental diets containing varying levels of wilted waterleaf fed to broiler chicken (finisher phase)

Parameter (%)	T1 (control)	T2 (5 g/kg)	T3 (10 g/kg)	SEM	P-value
Dry matter	93.65	93.21	93.15	0.08	0.07
Crude protein	21.42[c]	21.54[b]	21.67[a]	0.04	0.01
Crude fibre	3.27[c]	3.31[b]	3.60[a]	0.05	0.03
Nitrogen free extracts	72.32	73.39	74.28	0.28	0.08
Calcium	1.54[c]	1.57[b]	1.59[a]	0.01	0.01
Phosphorus	0.78	0.79	0.79	0.00	0.06
Methionine	0.47	0.47	0.48	0.00	0.08
Lysine	1.02	1.02	1.03	0.00	0.09
Metabolizable energy (kcal/kg)	3003.03[c]	3041.06[b]	3052.15[a]	7.44	0.01

[abc] Means significant ($p < 0.05$) difference within row; SEM: Standard Error of Mean.

ratio were significantly ($p < 0.05$) influenced with the supplementation of water leaf in the broiler's diet. Diet T3 (10.00 g/kg WL) recorded the highest body weight gain (1451.18 ± 17.06 kg) as shown in Figure 2, final weight (1490.74 ± 4.42 kg) and highest total feed intake (2451.58 ± 37.10 kg) as presented in Figure 1. However, birds fed Diet T1 had the highest FCR value (1.71 ± 0.01) compared to those fed Diet T2 and Diet T3 which had statistically similar FCR values of (1.67 ± 0.01) and (1.69 ± 0.01) as charted in Figure 3.

Haematological parameters of broiler chicken fed varying levels of dietary wilted waterleaf

Table 6 presents the haematological indices of broiler chicken fed varying levels of dietary water leaf. Results obtained showed that the parameters measured were not significantly ($p > 0.05$) influenced by WL with the exception of the mean cell volume (MCV), mean cell haemoglobin (MCH), granulocyte percent (GRA %) and monocyte percent (MON %). Birds fed diet T2 had significantly ($p < 0.05$) highest values for MCV (120.96 ± 5.18 fl), MCH (40.32 ± 1.82 pg/cell) and Lymphocyte percent (73.25 ± 1.74 %). The highest granulocyte percent (GRA %) (35.25 ± 1.55 %) was however recorded in birds fed control diet (0 g/kg of WL). Although not statistically ($p > 0.05$) significant, numerically superior values for packed cell volume (31.5 ± 1.19 %), mean cell haemoglobin concentration (33.25 ± 0.03 g/dl), haemoglobin (10.50 ± 0.40 Hbg/dl) and monocyte percent (2.25 ± 0.42 %) were also obtained

Table 5. Performance characteristics (weeks 1 – 6) of broiler chicken fed diets supplemented with varying levels of wilted waterleaf

Parameters	T1 (control)	T2 (5 g/kg)	T3 (10 g/kg)	SEM	P-value
Initial weight (g)	39.59	39.62	39.56	0.44	0.884
Final weight (g)	1457.68[b]	1482.86[a]	1490.74[a]	4.42	0.001
Weight gain (g)	1418.09[b]	1443.24[a]	1451.18[a]	17.06	0.001
Daily feed intake (g/day)	57.78	57.30	58.37	2.88	0.162
Total feed intake (g)	2426.89	2406.73	2451.58	37.10	0.162
Daily weight gain (g/day)	33.76[b]	34.36[a]	34.55[a]	0.40	0.001
Feed conversion ratio	1.71[a]	1.67[b]	1.69[ab]	0.01	0.004

[abc] Means significant ($p < 0.05$) difference within row; SEM: Standard Error of Mean.

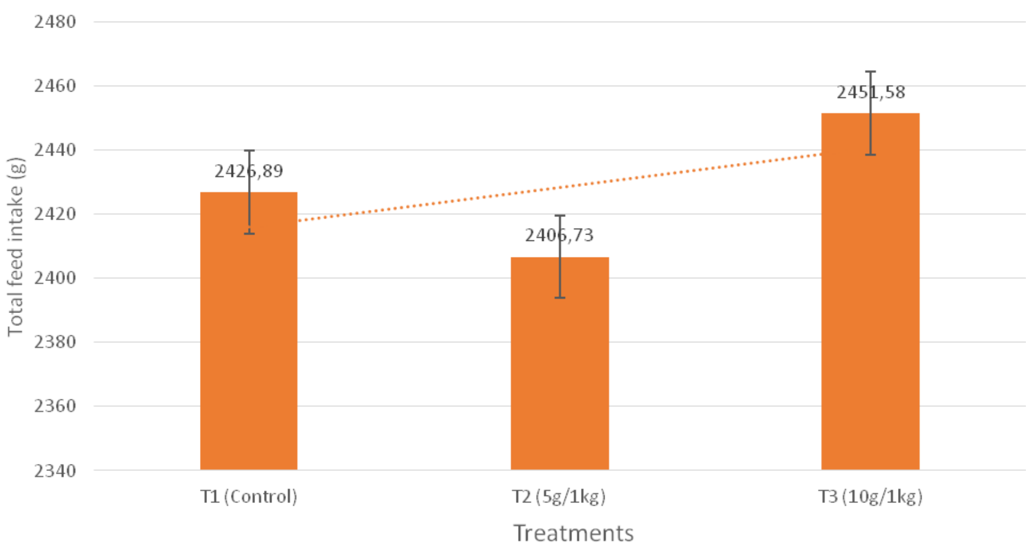

Figure 1. Total feed intake (g) of broiler fed varying levels of dietary waterleaf

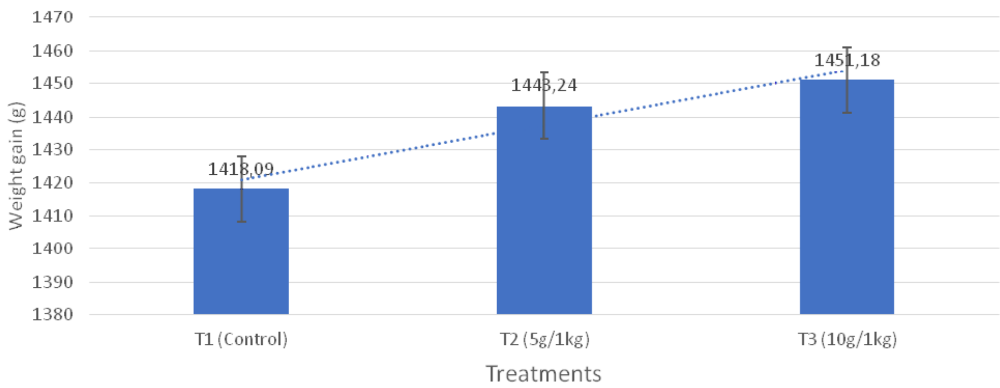

Figure 2. Weight gain (g) of broiler birds fed varying levels of dietary waterleaf

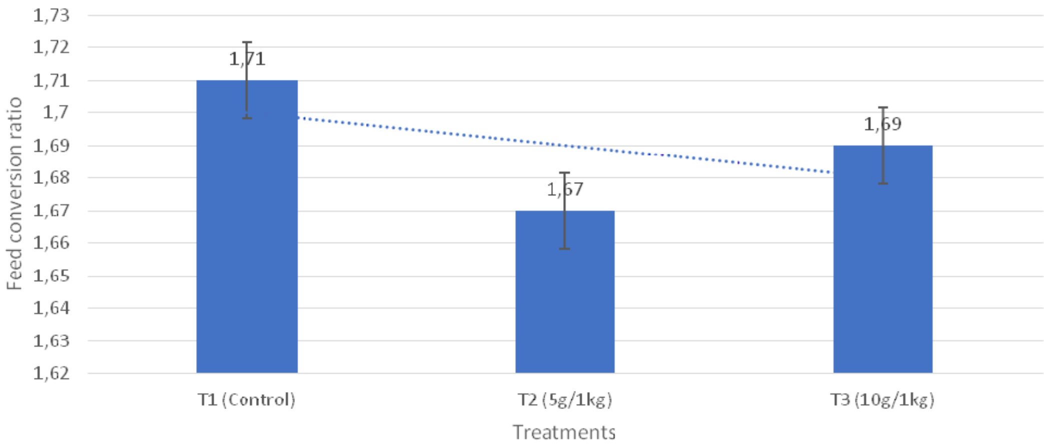

Figure 3. Feed conversion ratio of broiler birds fed varying levels of dietary waterleaf

from birds fed diet T2 (5 g/kg of WL). From the result, values for white blood cells (WBC) increased with increasing addition of WL with the lowest value (3.95 ± 0.37 x 10^9/L) obtained from birds fed diet T1 while birds fed Diet T3 recorded the highest (4.30 ± 0.37 x 10^9/L).

Serum biochemical indices of broiler chickens fed supplemented with varying levels of wilted waterleaf

The serum biochemical indices of broiler chickens fed varying levels of dietary waterleaf (Table 7) revealed that among all parameters measured, there were no significant ($p > 0.05$) differences. Birds fed dietary treatments recorded lower numerical values of aspartate aminotransferase (AST), total protein and globulin when compared to the values (90.55 IU/L ± 2.77, 40.63 IU/L ± 1.68 and 26.3 g/L ± 1.84; respectively) obtained from birds fed the control diet. The highest values (61.15 ± 5.11 mmol/L, 3.83 ± 0.18 mmol/L and 10.70 ± 0.83; respectively) of creatinine, cholesterol and alanine aminotransferase were recorded in birds fed diet T2. Aspartate aminotransferase, total protein and globulin recorded the highest values in birds fed control diet as: 90.55 ± 2.77 IU/L, 40.63 ± 1.68 g/L and 26.3 ± 1.84 g/L, respectively. However, the lowest values: 49.4 ± 5.11 mmol/L, 3.45 ± 0.18 mmol/L, 80.83 ± 2.77 IU/L, 7.50 ± 0.83 IU/L, 38.22 ± 1.68 g/L, 13.38 ± 0.60 g/L, 24.85 ± 1.84 g/L were obtained in birds fed diet supplemented with 10 g/kg wilted waterleaf for creatinine, cholesterol, aspartate aminotransferase, alanine aminotransferase, total protein, albumin and globulin, respectively.

Table 6. Haematological parameters of broiler chicken fed diet supplemented with varying levels of wilted waterleaf

Parameter (%)	T1 (control)	T2 (5 g/kg)	T3 (10 g/kg)	SEM	P-value
Packed cell volume (%)	26.5	31.5	27.0	1.19	0.170
Red blood cell (x 10^6/l)	3.10	2.68	2.83	0.15	0.548
MCHC (g/dl)	33.21	33.25	33.23	0.03	0.883
MCV (fl)	88.27[b]	120.96[a]	95.55[b]	5.18	0.007
MCH (pg/cell)	28.84[b]	40.32[a]	31.85[b]	1.82	0.009
Haemoglobin (Hbg/dl)	8.83	10.50	9.00	0.40	0.167
White blood cell (x 10^9/l)	3.95	4.05	4.30	0.37	0.937
Granulocyte (%)	35.25[a]	27.00[b]	30.50[ab]	1.55	0.080
Lymphocyte (%)	63.25[b]	73.25[a]	67.75[ab]	1.74	0.043
Monocyte (%)	1.50	2.25	1.75	0.42	0.800

[abc] Means significant ($p < 0.05$) difference within row; SEM: Standard Error of Mean.
Key: MCHC = Mean corpuscular haemoglobin concentration; MCV = Mean corpuscular volume; MCH = Mean corpuscular haemoglobin.

DISCUSSION

The dry matter contents obtained from feed during the starter phase (94.34 – 95.41 %) and finisher phase (93.15 – 93.65 %) were higher than the values (87 – 91 %) which were reported by Nworgu et al (2014) in an experiment in which broiler chicken feed was supplemented with water leaf meal. This implies that the shelf life of the feed will be improved without deterioration of protein and fat content among other nutrients. Increases observed in the crude protein and crude fibre could be as result of the protein and fibre content of the utilized WL which was found to contain 29.60 % CP and 8.59 % CF. These values are within the range of 28.82 – 32.22 % CP and 8.50 – 9.30 % CF reported by Adekanmi *et al.* (2020) in WL. The obtained crude protein values from the experimental diets suggest that the crude protein requirements (19 – 25 % CP) published by Fasuyi (2022) as necessary for muscle development and vital metabolic activities such as synthesis of cellular fluids in broiler chickens were met by the experimental diets at both phases. The range of metabolizable energy (3003.03 – 3090.03 kcal/kg) obtained in the study is within the range of 3000 – 3200 kcal/kg recommended by Bureau of Indian Standards (2007) to be adequate for body activities without any impairment to the liver. In terms of mineral composition, calcium and phosphorus were in the optimal proportion of ratio 2:1 and this allowed for proper growth and health of the bones as the broiler chickens showed no clinical manifestation of rickets, lameness or osteoporosis.

Table 7. Serum indices of broiler chickens fed diets supplemented with varying levels of wilted waterleaf

Parameter (%)	T1 (control)	T2 (5 g/kg)	T3 (10 g/kg)	SEM	P-value
Creatinine (mmol/L)	50.33	61.15	49.40	5.11	0.625
Cholesterol (mmol/L)	3.70	3.83	3.45	0.18	0.733
AST (IU/L)	90.55	84.75	80.83	2.77	0.391
ALT (IU/L)	9.98	10.70	7.50	0.83	0.281
Total Protein (g/L)	40.63	39.38	38.22	1.68	0.869
Albumin (g/L)	14.33	14.33	13.38	0.60	0.792
Globulin (g/L)	26.30	25.05	24.85	1.84	0.951

[abc] Means significant ($p < 0.05$) difference within row; SEM: Standard Error of Mean.
Key: AST = aspartate aminotransferase, ALT = Alanine aminotransaminase.

Overall, all values obtained from the proximate analysis of experimental diets indicated their competency to meet the nutritional needs of the birds in line with the NRC (1994) standard.

The values obtained in this study for final weight and weight gain showed that supplementation of broiler chickens' diet with waterleaf could be highly beneficial to performance of birds. This might suggest that waterleaf possesses good digestive profile that is capable of enhancing growth and improving feed conversion rates as previously observed by Ekine *et al.* (2020), Nworgu *et al.* (2014) and Sande (2015). The improved performance of bords fed supplemented diets over those fed control diets also supports findings by Nworgu *et al.* (2015) which reported the ability of waterleaf to enhance protein quality. Feed conversion ratio (FCR) refers to the measure of the amount of feed needed (in kg) to produce 1 kg of meat in broiler chickens. Improved FCR values observed in birds fed waterleaf supplemented diets could be linked to the presence of mucilage and dietary crude fibre in waterleaf which can enhance digestion process (Nworgu *et al.*, 2015; Adegbenro, 2020; Sodjinou *et al.*, 2024). The production of short-chain fatty acids by waterleaf could be an indication of prebiotic effects of waterleaf in broilers which can enhance their health status and influence feed conversion ratio.

Haematological parameters are tools which are efficient in monitoring blood toxicity which can influence blood and health condition of livestock (Isaac *et al.*, 2013). Haematological indices observed showed that the PCV values of the bird fed the dietary treatments were within the standard range of 22.0 – 35.0 % reported by Odunitan-Wayas *et al.* (2018). Thus, the birds were neither prone to erythrocytosis which results from an increase in blood cell mass nor anaemia (Shohe *et al.*, 2019). MCHC was not significantly influenced by dietary treatment. The value range (33.21 – 33.25 g/dl) agreed with the range of (30.20 – 36.2 g/dl) published by Gulland and Hawkey (1990) and was also in conformity with the range (32.43 – 33.76 g/dl) reported by Sunmola *et al.* (2019). Arogbodo *et al.* (2020) reported that MCHC within this range connoted normochromic and healthy conditions of the birds. MCV values (120.96 and 95.55 fL; respectively) obtained in birds fed 5 g/kg and 10 g/kg WL were within the range (90 – 140 fL) recommended by Mirtuka and Rawnsley (1997) for avian species. This suggested that WL meal might possess properties that could ensure normocytic condition of blood. The observed range (8.83 – 10.50 g/dl) for the haemoglobin count is considered healthy for the experimental birds as it was within the normal reported (7 – 13 g/dl) chickens reported by Bonous and Stedman (2000). This was also in sync with the value range (10 – 11.80 g/dl) obtained by Aikpitanyi and Imasuen (2019) when broiler chickens were orally administered lime fruit. The haemoglobin count value suggested the normalcy of RBC of experimental birds. Thus, the birds were not prone to polycythemia which results from high haemoglobin levels that causes stress to birds. Lymphocytes are a type of WBC that help fight off disease and infection. Although significantly ($p < 0.05$) influenced, the lymphocyte range (63.25 – 73.25 %) in this trial aligns with the range (45 – 75 %) reported by Gylstorff (1983) as optimal for immune activities in broilers with 5 g/kg WL supplementation showing the highest potential.

Serum proteins are mainly synthesized by the liver and they function in maintaining blood volume through colloidal osmotic effect, buffer blood pH, transport hormones and drugs, participate in cell coagulation and act as enzymes (Mellilo, 2013). Findings from this study revealed that supplementation of broiler diets with wilted waterleaf had no influence on serum metabolites as earlier reported by other researchers (Igene, 1999; Adeyemi *et al.*, 2000). Ekine *et al.* (2020) also reported that supplementary WL had no significant effects on albumin, creatinine and urea. However, findings from this study are in contrast with those of Nworgu *et al.* (2015) which noted differences in values of globulin, cholesterol, alanine aminotransferase and aspartate aminotransferase; variations which might be due to differences in levels of supplementation and processing. The observed cholesterol range (3.45 – 3.83 mmol/L) is in line with the range (3.55 – 10.25 mmol/L) published by Suchy *et al.* (1995) and Strakova *et al.* (2001). This suggested that experimental birds were not predisposed to cholesterol accumulation in their arterial walls which can restrict the flow of blood into the heart (Oloruntola *et al.*, 2019). The albumin values of 13.38 – 14.33 g/L recorded were in line with values (10.60 – 13.70 g/L) reported by Rezende *et al.* (2017). Ross *et al.* (1978) recommended albumin values of 10.80 – 16.10 g/L as recommended proper albumin function. According to Melillo (2013), albumin serves as a transport medium for several molecules and maintenance of blood oncotic pressure.

CONCLUSION

This exploratory study has revealed that waterleaf has a store of quality nutrients that are beneficial in improving palatability which enhances voluntary intake of feed and consequently improving weight gain of broiler chickens without detrimental effects on the health status of the birds as revealed by the haemato-biochemical indices. Thus, it is recommended that broiler farmers supplement their broiler diets with up to 10.00 g / kg of WL using the preparation treatment utilized for WL in this study for optimum growth performance and improved health status of their birds.

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Data Curation: OSO, T. S., POPOOLA, O. E.

Writing-original draft preparation: OSO, T. S., POPOOLA, O. E.

Writing-review and editing: AYENI, A. O., OLOWOYEYE, J. Ch.

Project administration: AYENI, A. O.

All authors have read and agreed to the published version of the manuscript.

INFORMED CONSENT STATEMENT

Not applicable.

DATA AVAILABILITY STATEMENT

The data presented in this study are available on request from the corresponding author.

CONFLICT OF INTEREST

All authors declare no conflict of interest.

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