HAEMATOLOGICAL AND SERUM BIOCHEMICAL INDICES OF BROILER CHICKENS FED VARYING LEVELS OF ALOE VERA (*Aloe barbadensis miller*) LEAF MEAL

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ABSTRACT
This study evaluated the haematological and serum biochemical indices of broiler chickens fed varying levels of Aloe vera (Aloe barbadensis miller) leaf meal. The dietary treatments included T1 (0g), T2 (150g), T3 (200g), T4 (250g), and T5 (300g) Aloe vera leaf meal per 100kg of feed. A total of 120-day-old broiler chicks were assigned to five groups (24 birds per treatment, 8 birds per replicate) in a completely randomized design (CRD). Feed and water were provided ad libitum. Measured parameters included packed cell volume, red and white blood cells, haemoglobin, lymphocytes, total protein, albumin, globulin, glucose, cholesterol, creatinine, urea, and uric acid. Aloe vera levels significantly (P<0.05) influenced haematological and most serum biochemical parameters, except albumin and globulin. Chickens fed 300g Aloe vera leaf meal exhibited improved blood indices and physiological balance without adverse effects. For optimal performance, 300g Aloe vera leaf meal is recommended.

Keywords: Haematology, Serum, Broiler chickens, Aloe vera leaf meal,

INTRODUCTION

The rise of antibiotic-resistant bacteria and antibiotic residues in animal products poses significant risks to human health, prompting a growing interest in alternatives to antibiotics for livestock medication (Olafadehan *et al.,* 2020). Globally, there are approximately 20,000 species of medicinal plants, with around 800 species used by different communities for treating diseases (Mahima *et al.,* 2012). Phytochemicals are categorized into primary compounds, such as chlorophyll, proteins, amino acids, and sugars, and secondary compounds, including alkaloids, flavonoids, saponins, phenols, terpenoids, and tannins (Abdul *et al.,* 2013). These compounds especially the secondary compounds offer numerous health benefits, such as anti-inflammatory, antifungal, antimicrobial, antioxidant, antiviral, neuroprotective, hepatoprotective, hypotensive, and antiaging properties (Alagbe *et al.*, 2020). Blood plays a critical role in transporting nutrients and materials throughout the body; any negative impact on blood, whether from nutrition or pathogens, can adversely affect the animal's overall health (Etim, 2010). Haemato-biochemical indices are widely used in nutritional studies in chickens (Adeyemi *et al.,* 2000). This study aims to investigate the effects of Aloe vera leaf meal on haematological and serum biochemical parameters of broiler chickens.

MATERIALS AND METHODS

The experiment was conducted at the Poultry Unit of Kabba College of Agriculture, Division of Agricultural Colleges, Ahmadu Bello University, Zaria, Kaduna State, located in Nigeria's Southern Guinea Savannah Zone (Latitude 7°53' N, Longitude 6°02' E, altitude 427m). Kabba experiences annual rainfall of 1500mm and temperatures between 18°C and 32°C (Kabba College Meteorological Section, 2023). One hundred twenty day-old unsexed Arbor Acre broiler chicks were purchased from a reputable farm in Ibadan, Oyo State, and randomly assigned into five groups of 24, each further divided into three replicates of eight. Fresh Aloe vera leaves from Kabba College's garden were washed, oven-dried at 40°C, ground, and added to feed. Aloe Vera Leaf Meal (AVLM) was included at 0g, 150g, 200g, 250g, and 300g per 100kg of feed for T1 to T5, respectively (Table 1). Chicks were housed on deep litter, and feed and water were provided *ad libitum* for 28 days.

Haematological and Biochemical Analysis

At the fourth week of the experiment, blood samples were collected from the wing veins of ten randomly selected birds per group. Samples for Haematology were placed in EDTA bottles, while those for biochemical analysis were collected in plain bottles. Parameters analysed included packed cell volume (PCV), red blood cell (RBC), white blood cell (WBC), haemoglobin count (Hb) and absolute counts of lymphocytes, monocytes, basophils, and

eosinophils. Biochemical indices like albumin, globulin, glucose, cholesterol, creatinine, urea, and uric acid were also studied (Schalms *et al.* 1986).

Statistical Analysis

All data obtained from the two experiments were subjected to analysis of variance (ANOVA) using the general linear model procedure in the Statistical Analysis System (SAS, 2002). Treatment means were compared for significant differences using Duncan's Multiple Range Test (Duncan, 1955).

Table 1: Composition of Experimental Diets for Broiler Chickens with Aloe Vera Leaf Meal (0 - 4 weeks)

	Inclusion levels of Aloe Vera Leaf Meal (g)				
Ingredients (Kg)	**0g**	**150**	**200**	**250**	**300**
Maize	52.10	52.10	52.10	52.10	51.90
SBC	27.00	27.00	27.00	27.00	27.00
GNC	15.00	15.00	15.00	15.00	15.00
Bone Meal	1.70	1.70	1.70	1.70	1.70
Limestone	2.00	2.00	2.00	2.00	2.00
AVLM	0.00	0.15	0.20	0.25	0.30
Salt	0.15	0.15	0.15	0.15	0.15
Lysine	1.30	1.30	1.30	1.30	1.30
Methionine	0.50	0.50	0.50	0.50	0.50
Vit-premix	0.25	0.25	0.25	0.25	0.25
Total (%)	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Analysis					
ME Kcal/kg	2789	2795	2797	2798	2799
Crude Protein (%)	24.00	24.00	24.00	24.00	24.00
Crude fibre (%)	4.29	4.37	4.42	4.45	4.45
E:P ratio (%)	112	112	112	112	112
Ether Extract (%)	4.77	4.83	4.85	4.86	4.89
Calcium (%)	1.26	1.26	1.26	1.26	1.26
Avail. P (%)	0.35	0.35	0.35	0.35	0.35
Ca:P Ratio	4.00	4.00	4.00	4.00	4.00
Lysine (%)	2.27	2.27	2.27	2.27	2.27
Meth+Cys (%)	0.67	0.67	0.67	0.67	0.67

SBC= Soya bean cake, GNC = Groundnut cake, ME = Metabolisable Energy, AVLM = Aloe Vera Leaf Meal,

Avail P = Available Phosphorus in percentage, Ca: P ratio = Calcium: Phosphorus ratio, Meth+Cys= Methionine +Cysteine.

RESULTS AND DISCUSSION

Effects of Varying Levels of Aloe Vera Leaf Meal on Haematological parameters of Broiler Chickens

The haematological parameters of broiler chickens fed varying levels of Aloe Vera Leaf Meal (AVLM) are presented in Table 2. Significant (P<0.05) differences were observed across the diets for all measured parameters. Birds fed diet T4 (250g AVLM) recorded the highest PCV and Hb values, while those on diet T5 (300g AVLM) showed the highest RBC, WBC, and lymphocyte counts compared to the control group. These findings indicate that higher levels of AVLM supplementation improve the health status of broiler chickens more effectively than lower levels or no supplementation. The results align with the findings of Isaac *et al.* (2013), who reported significant increases in PCV, Hb, RBC, and WBC when broilers were treated with Aloe vera gel at concentrations of 3% and 4% over 15 days. The observed improvement in haematological indices may be attributed to the nutrient composition of Aloe vera powder, which is rich in essential vitamins (A, C, E, and B-complex), choline, folic acid, histidine, glycine, and other amino acids. Isaac *et al.* (2013) reported that animals with optimal blood profiles often demonstrate superior health and performance outcomes.

Effects of Varying Levels of Aloe Vera Leaf Meal on Serum biochemical parameters of Broiler Chickens

The serum biochemical indices of broiler chickens fed varying levels of Aloe Vera Leaf Meal (AVLM) are presented in Table 3. Significant (P<0.05) differences were observed across treatments for all measured parameters except albumin and globulin, which showed no significant (P>0.05) variation. Birds fed 300g AVLM recorded the highest values for total protein, glucose, and creatinine compared to the control diet, indicating that AVLM inclusion enhances serum protein levels in broiler chickens. The significant increase in serum protein in diets supplemented with AVLM suggests that beneficial microbes improved protein digestion and utilization compared to the control. Beski and Al-Sardary (2015) reported higher glucose levels in broiler diets with herbal plants and this align with the present result. This indicates sufficient energy for metabolic functions in birds fed AVLM diets. Birds fed 300g AVLM exhibited the lowest cholesterol levels, while the control group had the highest, likely due to the active ingredients in AVLM that reduce serum cholesterol through its antibacterial, antioxidant, and antimicrobial properties. Low urea levels suggest efficient metabolism and proper renal and hepatic function (Adeyemo and Sani, 2013), highlighting 300g AVLM as the most effective level for broiler chicken metabolism.

Table 2: Haematological parameters of Broiler Chickens Fed with Aloe Vera Leaf Meal (0- 4weeks)

Parameters	0	150g	200g	250g	300g	SEM
Packed cell volume (%)	20.33^{d}	25.39^{c}	27.70^{b}	32.07^{a}	32.00^{a}	0.71
Haemoglobin count (g/dl)	8.16^{d}	10.11^{c}	11.77^{b}	12.07^{a}	12.00^{a}	0.21
Red blood cell ($10^{6}mm^{3}$)	3.35^{e}	3.73^{d}	4.22^{c}	4.62^{b}	5.15^{a}	0.07
White blood cell ($10^{6}mm^{3}$)	6.67^{d}	10.25^{c}	15.87^{b}	18.01^{a}	19.22^{a}	0.67
Lymphocytes (%)	24.82^{e}	26.13^{d}	31.03^{c}	31.54^{b}	34.05^{a}	0.75
Monocyte (%)	0.98^{d}	1.73^{a}	1.67^{a}	1.52^{b}	1.47^{c}	0.03
Basophil (%)	1.01^{d}	1.73^{a}	1.67^{a}	1.52^{b}	1.47^{c}	0.03
Eosinophil (%)	1.00^{b}	2.00^{a}	1.00^{b}	1.00^{b}	1.00^{b}	0.01

abc: Means with different superscripts on the same row are significantly different (P<0.05), g/d= gram/day, g/b/d= gram/bird/day, SEM = Standard Error of Mean.

Table 3: Serum biochemical parameters of Broiler Chickens Fed with Aloe Vera Leaf Meal (0- 4weeks)

Parameters	0	150g	200g	250g	300g	SEM
Total protein (g/dl)	7.10^{b}	8.31^{a}	8.76^{a}	8.54^{a}	8.46^{a}	0.38
Albumin (g/dl)	5.09	5.98	6.09	6.56	6.45	2.01
Globulin g/dl	2.01	2.33	2.67	2.98	2.01	0.004
Glucose (g/mol)	4.56^{e}	8.12^{d}	9.94^{c}	10.13^{b}	11.66^{a}	0.11
Cholesterol (µ/mol)	216^{a}	205^{b}	188.05^{c}	184.59^{d}	160.77^{e}	0.07
Creatinine (g/mol)	19.91^{c}	21.03^{b}	26.22^{a}	26.44^{a}	26.04^{a}	0.31
Urea (g/mol)	2.92^{a}	1.47^{b}	1.19^{c}	1.16^{d}	1.06^{e}	0.02
Uric acid (µ/mol)	5.15^{b}	6.20^{a}	6.20^{a}	5.09^{c}	4.11^{d}	0.01

abc: Means with different superscripts on the same row are significantly different (P<0.05), SEM = Standard Error of Mean, NFE= Nitrogen free extract

CONCLUSION AND RECOMMENDATION

The study concluded that supplementing broiler diets with 300g of Aloe vera leaf meal improves the health status of broiler chickens as is often revealed in their haematological and biochemical characteristics. This supplementation offers a natural alternative to antibiotics, promoting healthier broiler production.

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