

GROWTH PERFORMANCE AND NUTRIENT DIGESTIBILITY OF BROILER CHICKENS FED VARYING LEVELS OF ALOE VERA (*Aloe barbadensis miller*) LEAF MEAL

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ABSTRACT

This study evaluated the growth performance and nutrient digestibility of broiler chickens fed varying levels of Aloe vera (Aloe barbadensis miller) leaf meal. The dietary treatments were 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 Arbor Acre broiler chicks were allocated to five dietary groups, with 24 birds per treatment and 8 birds per replicate, following a completely randomized design (CRD). Feed and water were provided ad libitum throughout the study. Key performance indicators, including final weight, weight gain, average daily weight gain, total feed intake, and feed conversion ratio, showed significant ($P<0.05$) differences among the treatments. Nutrient digestibility was also significantly ($P<0.05$) affected by the Aloe vera levels. Results indicated that chickens fed 250g Aloe vera leaf meal demonstrated the best performance and nutrient digestibility. For optimal productivity, 250g Aloe vera leaf meal is recommended.

Keywords: Performance, Broiler chickens, Aloe vera leaf meal, Nutrient digestibility

INTRODUCTION

Aloe vera (*Aloe barbadensis miller*), a succulent plant from the *Liliaceae* family, is renowned for its medicinal and therapeutic properties, including antioxidant, anti-inflammatory, antimicrobial, and immune-modulating effects. Its use as a feed additive in poultry diets has gained attention for its potential to enhance growth performance, nutrient digestibility, feed efficiency, immune health, and overall well-being in broiler chickens (Moorthy *et al.*, 2009). Aloe vera contains bioactive compounds such as polysaccharides, amino acids, vitamins, minerals, and enzymes, which are believed to support digestion and health in poultry (El-Shemy *et al.*, 2010). Studies also highlight its antioxidant, anti-cancer, anti-mutagenic, and anti-hypersensitivity effects (El-Shemy *et al.*, 2010). Key components include anthraquinones, saccharides, vitamins, enzymes, and low-molecular-weight compounds (Choi and Chung, 2003). This study aims to investigate the effects of Aloe vera leaf meal on broiler chickens' growth performance and nutrient digestibility.

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. Kabba is situated in Nigeria's Southern Guinea Savannah Ecological Zone at Latitude 7°53' N and Longitude 6°02' E, with an altitude of 427m above sea level. The area experiences an average annual rainfall of approximately 1500mm and temperatures ranging from 18°C to 32°C (Kabba College of Agriculture Meteorological Section, 2023). A total of 120-day-old unsexed Arbor Acre broiler chicks were sourced from a reputable farm in Ibadan, Oyo State. The chicks were allocated into five groups of 24 in a completely randomized design, with each group further divided into three replicates of eight chicks each. Fresh, mature Aloe vera leaves were collected from Kabba College's horticultural garden, washed, oven-dried at 40°C until a constant weight was achieved, and ground into fine particles using an electric blender before being incorporated into the feed. Deep litter housing was prepared before the chicks' arrival. Their initial and final weights were recorded over 28 days, along with feed intake. Aloe Vera Leaf Meal (AVLM) was added to the diets at levels of 0g, 150g, 200g, 250g, and 300g per 100kg of feed for T1, T2, T3, T4, and T5, respectively. Feed and water were provided *ad libitum*.

Data Collection and Statistical analysis

Initial and final weights of the birds were recorded at the start and end of the experiment. Parameters such as weight gain, feed intake, and feed conversion ratio were calculated, while mortality was recorded as it occurred. A digestibility trial was conducted during the final week of the study (4 weeks of age). Three birds from each replicate were housed in clean, disinfected metabolic cages with polythene bags placed beneath for faecal

collection. The birds were given three days to acclimatize before the trial began. A known quantity of feed was provided daily at 8:00 am during the trial period. Faeces were collected over four days, dried, weighed, and ground. Both the faecal samples and the feed samples were analysed for proximate composition at the Biochemical Laboratory, Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria, following A.O.A.C. (2000) methods. Data collected were statistically analysed 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
Energy:Protein 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 Growth Performance of Broiler Chickens

The growth performance of broiler chickens fed graded levels of Aloe Vera Leaf Meal (AVLM) is shown in Table 2. Significant ($P<0.05$) differences were observed across diets for final body weight, weight gain, average daily weight gain, total feed intake, average feed intake, feed conversion ratio (FCR), and mortality. Birds fed diet T4 (250g AVLM) achieved the highest final body weight, weight gain, and average daily weight gain (2627.07g, 2587.07g, and 46.20g/day, respectively), while the lowest values were recorded for those on the control diet (T1). Additionally, birds in treatment T4 had the best FCR (1.47) compared to the control group.

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

Parameters	0	150g	200g	250g	300g	SEM
Initial weight(g/b)	40.00	41.00	40.00	40.00	41.00	0.06
Final weight (g/b)	2040.00 ^b	1929.89 ^c	2045.77 ^b	2627.07 ^a	2041.00 ^b	10.74
Weight gain(g/b)	2000.00 ^b	1888.89 ^c	2005.77 ^b	2587.07 ^a	2000.01 ^b	12.86
Average Daily Weight Gain (g/b/d)	35.71 ^b	33.73 ^c	35.82 ^b	46.20 ^a	35.71 ^b	0.60
Feed Intake (g/b)	3955.66 ^a	3276.78 ^d	3355.87 ^c	3865.01 ^b	2881.22 ^c	2.67
Daily Feed Intake (g/b/d)	164.82 ^a	136.53 ^d	139.83 ^c	161.04 ^b	120.05 ^c	1.05
Feed Conversion Ratio	1.98 ^c	1.73 ^b	1.67 ^b	1.52 ^a	1.47 ^a	0.03
Mortality	3.00 ^a	2.00 ^b	1.00 ^c	1.00 ^c	1.00 ^c	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.

These results suggest that higher AVLm levels promote better growth performance in broiler chickens than lower levels or no supplementation. The results align with Ahmed *et al.* (2019), who reported significantly higher final weight and weight gain in broilers fed 0.5% Aloe vera powder compared to control group. Similarly, Shini *et al.* (2016) and Abd El-Hack *et al.* (2020) found that Aloe vera supplementation improved feed intake, weight gain, and FCR, this is attributed to enhanced digestive enzyme activity and improved gut health. A better FCR indicates efficient feed-to-body mass conversion. The inclusion of Aloe vera leaf meal in broiler diets enhances nutrient utilization efficiency, demonstrating its potential as a natural growth promoter and a valuable feed additive in poultry production.

Effects of Varying Levels of Aloe Vera Leaf Meal on Nutrient Digestibility of Broiler Chickens

The nutrient digestibility results of broiler chickens fed graded levels of Aloe Vera Leaf Meal (AVLM) are shown in Table 3. Significant ($P < 0.05$) differences were observed among the treatments for all measured parameters. Digestibility coefficients for dry matter, crude protein, crude fibre, ether extract, ash, and nitrogen-free extract (NFE) were highest in birds fed diets containing 250g AVLM. The enhanced digestibility of protein, fibre, ether extract, carbohydrates, and fats in broilers fed AVLM can be attributed to the presence of protease enzymes, as well as amylase-like and lipase activity in Aloe vera. These enzymes promote efficient protein breakdown, starch digestion, and fat absorption, contributing to improved nutrient utilization and growth performance. These findings agreed with the reports of Shini *et al.* (2016) and Mansoub *et al.* (2021), who demonstrated that Aloe vera supplementation enhances broiler digestive performance. They found that broilers fed Aloe vera extract exhibited higher protein digestibility and significantly improved carbohydrate and fat digestibility compared to control groups.

Table 3: Digestibility Trial of Broiler Chickens Fed with Aloe Vera Leaf Meal (0- 4weeks)

Parameters (%)	0	150g	200g	250g	300g	SEM
Dry matter	44.00 ^d	50.80 ^c	55.60 ^b	64.56 ^a	62.00 ^a	4.38
Crude protein	56.09 ^d	59.98 ^{bc}	61.09 ^{ab}	66.56 ^a	64.45 ^a	2.01
Crude fibre	18.01 ^a	21.33 ^a	26.67 ^a	25.98 ^a	22.01 ^a	0.43
Ether extract	54.56 ^c	58.12 ^{bd}	59.94 ^b	60.13 ^a	58.66 ^{bc}	0.19
Ash retention	19.91 ^c	21.03 ^b	26.22 ^a	26.44 ^a	26.04 ^a	0.31
NFE	48.57 ^d	60.06 ^c	69.92 ^b	79.09 ^a	71.16 ^a	4.17

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 250g of Aloe vera leaf meal enhances performance and nutrient digestibility, resulting in improved nutrient absorption, better feed conversion, and increased growth performance. This supplementation offers a natural alternative to antibiotics, promoting healthier broiler production. Extension agents are encouraged to advocate for the use of Aloe vera leaf meal among farmers, as it can boost growth rates and profitability, supporting sustainable and efficient poultry farming practices.

REFERENCES

- A.O.A.C. (2000). Official Methods of Analysis, 17th edition Association of Official Analytical Chemists. Washington, DC.
- Abd El-Hack, M.E. (2020). "The effects of Aloe vera gel as a feed additive in poultry diets: Impact on growth performance and immunity." *Journal of Animal Science and Biotechnology*, 11(1): 40
- Ahmed, M. (2019). "Effect of dietary supplementation of Aloe vera powder on growth performance and immune responses in broiler chicks." *Poultry Science Journal*, 98(2): 375-380.
- Choi, S. and Chung, M.H. (2003). Review on the relationship between Aloe vera components and their biologic effects. *Seminars in Integrative Medicine*, 1(1):53-62.

- Duncan, D.B. (1955). Multiple Range and Multiple F Test. *Biometrics*, 11:1-42.
- El-Shemy, H.A., Aboul-Soud, M.A.M., Nassr-Allah, A.A., Aboul-Enein, K.M. Kabash, A. and Yagi, A. (2010) Antitumor properties and modulation of antioxidant enzymes' activity by Aloe vera leaf active principles isolated via supercritical carbon dioxide extraction. *Current Medicinal Chemistry*, 17(2):129-38.
- Kabba College of Agriculture Metrological Section (2023).
- Mansoub, N.H. (2021). "The effect of Aloe vera supplementation on growth performance, antioxidant activity, and immunity of broiler chickens." *Tropical Animal Health and Production*, 53(2): 202- 209.
- Moorthy, M. and Viswanathan, K. (2009). Nutritive value of extracted coconut (*Cocos nucifera*) meal. *Research journal of agriculture and biological sciences* 5 (4): 515-517.
- SAS, (2004). SAS/STAT guide for personal computers (SAS Institute).
- Shini, S. (2016). "Effect of dietary Aloe vera on feed intake, growth performance, and immune responses in broiler chickens." *Poultry Science*, 95(8): 1718-1724.