

Growth Performance and Cost Benefit of Finisher Broilers Fed Diets Supplemented with Graded Levels of *Aloe vera* Leaf Meal

Olabode Adeyemi David, Nduka Christiana, Ogbaka Kenneth, Anochiam Alex,
Ngwoke Celestine and Ogwumike Chinonso
Federal College of Agriculture, Ishiagu, Ebonyi State, Nigeria

ABSTRACT

Background and Objective: The need to adopt natural herbal plants as feed additives in poultry production has gained attention among animal nutritionists and productionists in recent years. Herbal plants have little or no side effects, unlike synthetic additives. The experiment was conducted at the poultry site of Federal College of Agriculture, Ishiagu in Ebonyi State to determine the growth performance and cost-benefit analysis of broilers at the finisher stage. **Materials and Methods:** Ninety-six (96) four weeks old broiler birds of Ross 308 strain were used for the experimental work. The birds were randomly selected into four treatment groups of twenty four, each replicated thrice with eight birds per replicate in a Completely Randomized Design (CRD). Feed and water were given to the bird's *ad libitum* throughout the experiment, which lasted for 21 days. **Results:** The proximate analysis showed that *Aloe vera* leaf meal had about 93.58% dry matter, 6.42% moisture, 10.42% crude protein, 6.45% crude fiber, 2.03% ether extract, 18.77% ash and 55.91% carbohydrate. Data obtained for growth performance revealed that birds in treatment 2 (0.50% avp) were superior in terms of final body weight, body weight gain and feed conversion ratio with values of 2694.10 and 1973.40 g. Results for cost-benefit analysis showed that birds in treatment 2 (0.50% avp) had better benefit/profit of 1415.86 when compared with that of control with a value of 1363.25. **Conclusion:** Thus, it can be concluded that the inclusion of *Aloe vera* powder in the diet of finisher broiler birds up to the level of 1.50% is possible, with the best performance in treatment 2 (0.50% avp).

KEYWORDS

Growth performance, finisher broiler, cost-benefit, *Aloe vera*, proximate analysis

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INTRODUCTION

The need to adopt natural herbal plants as feed additives in poultry production has gained attention among animal nutritionists and productionist in recent years. Herbal plants have little or no side effects, unlike synthetic additives. Poultry production is a diversified business that requires proper attention in terms of feeds consumed and drug administration. In recent times the use of synthetic feed additives in the growing of poultry birds, especially broiler birds to the finish stage has become a great concern to both animal nutritionists and the end users which is humans. Consequently, the ban placed on the use



of antibiotics growth promoters over the years and some other synthetic feed additives used as growth promoters to stimulate growth and performance of poultry and other livestock production due to its negative and harmful effect on the livestock and the humans that consume those products and by-products have necessitated the search for alternative natural feed materials in the diets of the animals¹.

These feed substances include leaves of plants, oils from plants, barks and stems, extract of plants origin, etc. Among the most populous ones are the leaves, which include those of moringa, neem, bitter leaf, scent leaf, *Aloe vera*, etc. Natural feed substances or additives have been added into the ration and diet of poultry birds in recent times and have been reported to reduce morbidity and mortality and also in some cases enhance growth performance². *Aloe vera* (*Aloe barbadensis*) consists of several medicinal values as anti-fungal, anti-inflammatory, immune-modulatory, anti-viral and anti-oxidant and they are also rich in amino acids, minerals and vitamins³. The plant also contains anthraquinones, saccharides, enzymes and some other low-molecular weight compounds⁴. They are rich in specific vitamins such as vitamin A (Beta-carotene), vitamin B1 (Thiamine), vitamin B2 (Riboflavin), vitamin B3 (Niacin), vitamin B5, vitamin B6 (Pyridoxine), vitamin B12, vitamin C, vitamin E, choline and folic acid⁵. Vitamin A, C and E are also responsible for the aloe's anti-oxidant activity, while vitamin B and choline are involved in amino acid metabolism and vitamin B12 is required for both the production and development of blood cells in the animals. Among the important minerals found in *Aloe vera* include; calcium, chromium, copper, iron, magnesium, manganese, potassium, phosphorus, sodium and zinc⁶. They are also rich in hormones, sugars, anthraquinones or phenolic compounds, lignin, saponins, sterols and salicylic acids⁷. To this end, the research work is channeled towards the alternating of synthetic feed additives to natural phytogetic ones which have little or no mutation effect or resistance and recessive factors. Thus, the research work is aimed at determining the impact of *Aloe vera* leaf meal on the growth performance and cost benefit analysis of finisher broilers.

MATERIALS AND METHODS

Experimental site: The research work was carried out at the poultry section of Animal Production Technology Department, Federal College of Agriculture, Ishiagu, Ebonyi State from July to September, 2023.

Source and processing of the *Aloe vera*: The *Aloe vera* leaves that were used for the research work were sourced from Ishiagu Town and the environment all within Ebonyi State. The *Aloe vera* leaves were obtained fresh, washed, sliced into thinner/smaller sizes and then sun-dried to get a crispy-like material. The crispy materials were then ground to powder and incorporated into the diets of the birds at graded levels of 0, 0.50, 1.00 and 1.50%, respectively (Table 1). The Completely Randomized Design (CRD) was used in the research work.

Experimental design and management of the birds: Ninety-six four weeks old 'Rose 308' strain of broiler birds was used for the research. The birds were randomly allocated to four treatment groups, each having twenty-four birds with three replicates consisting of eight birds per replicate. Feed and water were given *ad libitum*. Vaccines and drugs (purchased from Cosin Veterinary shop in Enugu State) were administered when due and necessary as regards the state of health of the birds. The initial weight of the birds was obtained at the beginning of the study and then at the end of the research work.

Feed intake was recorded as the difference between the quantity of feed given the previous day and the quantity that was left the next day. Feed conversation ratio was obtained as the ratio of feed intake divided by the body weight gain. A proximate analysis of the test ingredient was also carried out (Table 2).

Table 1: Experimental diet for finisher broilers fed supplemental levels of *Aloe vera* powder

Ingredients	Treatments			
	T1	T2	T3	T4
Maize	58.00	58.00	58.00	58.00
Wheat offal	6.90	6.75	6.60	6.45
Soyabean meal	2.00	2.00	2.00	2.00
Full fat soya	7.00	7.00	7.00	7.00
Groundnut cake	10.00	9.65	9.45	9.25
Fish meal	1.00	1.00	1.00	1.00
Blood meal	3.50	3.50	3.50	3.50
Palm kernel cake	6.50	6.50	6.35	6.20
<i>Aloe vera</i> powder	0.00	0.50	1.00	1.50
Limestone	1.50	1.50	1.50	1.50
Bone meal	2.50	2.50	2.50	2.50
Methionine	0.30	0.30	0.30	0.30
Lysine	0.20	0.20	0.20	0.20
Premix	0.35	0.35	0.35	0.35
Salt	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated value				
Crude protein (%)	19.05	18.90	18.81	18.72
Menergy (Kcal/kg)	2950.94	2940.85	2930.48	2920.19
Crude fibre (%)	3.93	3.91	3.81	3.84
Ether extract (%)	4.31	4.29	4.28	4.26
Calcium (%)	1.26	1.26	1.26	1.26
Phosphorus (%)	0.53	0.53	0.53	0.53
Methionine (%)	0.62	0.62	0.62	0.62
Lysine (%)	1.06	1.05	1.05	1.05

Table 2: Proximate composition of *Aloe vera* powder

Components	Composition (%)
Dry matter	93.58
Moisture	6.42
Crude protein	10.42
Crude fibre	6.45
Ether extract	2.03
Ash	18.77
Carbohydrate	55.91
Metabolizable energy (Kcal/kg)	2494.10

Statistical analysis: Data collected in the research work were subjected to Analysis of Variance (ANOVA) at 5% level. Significant differences were separated according to the method of Duncan's Multiple Range Test. Cost-benefit analysis was calculated using the procedure outlined by Olabode *et al.*² as follows:

$$\text{Cost of bird} = \text{Amount expended or spent on purchase of birds}$$

$$\text{Cost per kg of feed} = \text{Cost of feed}/25 \text{ kg}$$

$$\text{Cost of feed consumed} = \text{Total feed intake} \times \text{Cost per kg of feed}/1000$$

$$\text{Managerial cost} = \text{Cost of vaccines, drugs, litter, transportation etc.}$$

$$\text{Total cost of production} = a+c+d$$

$$\text{Revenue} = \text{Average final weight of birds} \times \text{Cost per kg of current market price of 1 kg meat of broiler bird}/1000$$

$$\text{Benefit of profit} = \text{Revenue}-\text{Cost of production}$$

$$\text{Cost benefit ratio} = \text{Cost of production}/\text{benefit}$$

RESULTS AND DISCUSSION

Data obtained from the research work was presented in Table 3. Results of growth performance of broiler birds fed diets supplemented with graded levels of *Aloe vera* powder showed that a superior ($p < 0.05$) value of 2694.10 g for final body weight was obtained for birds in treatment 2, which did not differ ($p > 0.05$) from the value of 2670.67 g observed for birds in treatment 1 (control). While, the least value of 2580.30 g for final body weight was seen in treatment 4, which was significantly ($p < 0.05$) different from the value of 2601.52 g obtained in treatment 3, respectively. The superior value for final body weight obtained in treatment 2 could be a result of the bird's ability to maximize and extract the necessary nutrients and bio-nutrients that support growth in the *Aloe vera* powder at that level of inclusion. According to Mohammed⁶ *Aloe vera* is rich in vitamin B and choline which are involved in amino acid metabolism and vitamin B12 which is required for the production and development of blood cells in the body of the birds. The growth factor could also be traced to the availability of essential minerals like calcium, magnesium, iron and zinc which are embedded in the *Aloe vera*. Bernard *et al.*⁷ also reported the rich store of hormones and other phenolic compounds in *Aloe vera*, which are usually associated with growth. The results at this stage (0.50% avp) were similar to the work carried out by Mmereole⁸, who reported higher final body weight and body weight gain in broiler birds fed diets supplemented with *Aloe vera* leaf meal.

Similar results were obtained by Sinurat *et al.*⁹ where they obtained performance in broilers with 0.75 and 1.00% *Aloe vera* powder compared to those at the 0.50% level of *Aloe vera* powder treatment group. A higher ($p < 0.05$) value of 124.70 g was obtained in treatment 1, which was significantly different from the value of 123.90 g obtained for birds in treatment 2. The least value of 122.10 g was observed in treatment 4, which did not differ ($p > 0.05$) from the value of 122.91 g seen in treatment 3.

The declining values obtained for daily feed intake in treatments without *Aloe vera* supplementation suggest that *Aloe vera* is embedded with substances that are not palatable to the birds. The result obtained in the present study agreed with the report of Eevuri and Putturu¹⁰, who observed a low consumption rate in broiler birds at the finisher phase of growth with increasing supplementation of *Aloe vera* powder in their diets. Data obtained for feed conversion ratio revealed that a higher value of 1.38 was obtained for birds in treatment 4, which was similar ($p > 0.05$) to those in treatment 3 with a value of 1.37. The least value of 1.32, which connotes the best performance in the treatments was observed in treatment 2, which was significantly ($p < 0.05$) different from the value of 1.34 obtained in treatment 1, respectively. The significant difference obtained in the treatment group for feed conversion ratio was similar to the results obtained by Amaechi and Iheanetu¹¹, where they observed a significant ($p < 0.05$) difference in feed conversion ratio between treatment groups fortified with *Aloe vera* powder.

Table 3: Growth performance and cost benefit analysis of finisher broilers fed graded levels of *Aloe vera* powder

Parameters	Treatments				SEM
	T1	T2	T3	T4	
Initial body weight (g)	720.89	720.70	720.45	721.10	-
Final body weight (g)	2670.67 ^a	2694.10 ^a	2601.52 ^b	2580.30 ^c	82
Body weight gain (g)	1949.78 ^b	1973.40 ^a	1881.07 ^c	1859.20 ^d	49
Daily body weight gain (g)	92.85 ^a	93.97 ^a	89.58 ^b	88.53 ^b	28
Daily feed intake (g)	124.70 ^a	123.90 ^b	122.91 ^c	122.10 ^c	36
Feed conversion ratio	1.34 ^b	1.32 ^c	1.37 ^a	1.38 ^a	0.12
Cost of birds at 4wks (#)	2200.00	2200.00	2200.00	2200.00	-
Cost of kg of feed (#)	265.00 ^a	262.70 ^a	259.21 ^b	254.92 ^c	25
Cost of feed cons (#)	693.96 ^a	683.52 ^b	669.05 ^c	653.64 ^d	39
Managerial cost (#)	550.00	550.00	550.00	550.00	-
Total cost (#)	3443.96	3433.52	3419.05	3403.64	67
Revenue (#)	4807.21 ^a	4849.38 ^a	4682.74 ^b	4644.54 ^c	88
Benefit/profit (#)	1363.25 ^b	1415.86 ^a	1263.69 ^c	1240.90 ^d	33
Cost benefit ratio	2.53	2.43	2.71	2.74	0.42

^{abcd}Means on the same row with different superscripts are significantly ($p < 0.05$) different

Results obtained for cost-benefit analysis revealed that the cost of kg of feed and cost of feed consumed decreased as the level of *Aloe vera* powder increased across the treatment group, while the revenue, benefit and cost-benefit ratio was higher in treatment 2 (4,849.38, 1415.86 and 2.43, respectively). The results corresponded with those obtained by Onyimonyi *et al.*¹² where they reported better revenue, profit and cost-benefit ratio in treatment with 0.5% level of neem leaf meal when supplemented into the diet of broiler chickens. Also, Agu *et al.*¹³ observed better cost benefits in treatments treated with turmeric powder as compared to those on control in finisher broiler birds.

CONCLUSION

It can be concluded that *Aloe vera* powder can be supplemented into the diet of the birds at finisher stage up to the level of 1.50% without any morbidity and mortality, though the best level of inclusion in this present research is at the level of 0.50% which correspond to treatment 2, where superior growth performance and better profit were also obtained. The study recommended the use of different processing methods and the use of *Aloe vera* in other species of poultry birds.

SIGNIFICANCE STATEMENT

With the continuous impact of mutation and the recessive effect of synthetic feed additives, it is greatly necessary to shift from synthetic feed additives to natural feed additives which have little or no issues of such. *Aloe vera*, which is also a phyto-genic plant material, is rich in bio-active nutrients, anti-oxidants and anti-microbial properties. Its ability to thrive in areas and regions where it is found is of great advantage. From the research work, it can be stipulated that *Aloe vera* powder can be used in the diet of broiler birds with great positive impact.

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