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GROWTH PERFORMANCE AND COST BENEFIT ANALYSIS OF BROILER STARTER CHICKENS FED DIETS CONTAINING GRADED LEVELS OF ALOE VERA (*Aloe barbadensis*) LEAF MEAL

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ABSTRACT

A research work was carried out to determine the impact of Aloe vera leaf meal on the growth performance and cost benefit analysis of broiler starter birds. A total number of ninety-six (96) day old 'Agritech' broiler birds were used for the research work. The birds were brooded for a week after which they were randomly distributed into four treatment groups of twenty-four each replicated three times with eight birds per replicate. Four different diets labelled T1, T2, T3 and T4 were formulated such that the Aloe vera leaf meal was incorporated at inclusion rate of 0.50 %, 1.00 % and 1.50 % in the diets respectively, while treatment 1 served as the control with 0 % level of Aloe vera leaf meal. Feed and water were given ad-libitum throughout the experimental period of twenty-one days. Proximate composition of the Aloe vera leaf meal had 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. Birds on control diet were superior to birds in other treatments in terms of final body weight, body weight gain, feed intake and feed conversion ratio. Thus, birds in treatment 1 (control) had better performance compared to birds fed diets containing aloe vera under review. Result for cost benefit analysis showed that birds in treatment 4 had a superior ($P<0.05$) benefit/profit of ₦ 471.99 when compared to the control with ₦ 440.47. From the results obtained it can be concluded that the inclusion of Aloe vera powder in the diet of broiler starter chickens up to the level of 1.50% can be tolerated by the birds. I therefore would recommend that the Aloe vera powder should be used in the diets of other poultry birds like layers, turkey, duck, geese, quail etc to determine the impart and effect in other birds. Also, that other methods of processing should be adopted.

Keywords: Growth performance, broiler starter, cost benefit, Aloe vera leaf, proximate composition

INTRODUCTION

The provision of feed has been reported to account for 60-80% of total cost of livestock production in developing countries alone (Mohammed, 2015). In view of this, there is increased interest by poultry farmers on the search for non-conventional feed ingredients that could be cheaper such as leaf and seed meals of ethno-medicinal plants (Doley *et al*., 2014). One way is to look for alternative source of feed supplement that is not only cheap and could boost the growth of chickens is organic and readily available. Recently, phytogenic feed additives gained importance due to the restriction of using antibiotics as growth promoters by European Union, but there is a lack of knowledge about their modes of actions (Windisch *et al*., 2008). It was reported that, these products of plant origin are natural, less toxic, residue free and ideal feed additives for animals when compared to synthetic antibiotics or inorganic chemicals. Antimicrobial and antifungal properties of phytogenic substances and antiparasitics effects were also observed (Okitoi *et al*., 2007). Although, phytogenic herbal extracts received considerable attention in the broiler industries as friendly alternatives to antibiotics, these additives can be included in the feed or drinking water to enhance bird's growth rate and well-being.

Aloe vera (*Aloe barbadensis*) belongs to the family of lily; It is spiky, succulent, and perennial. It is native to the eastern and southern part of Africa but it has spread throughout the other parts of West Africa like Nigeria. Aloe vera powder is rich in vitamins and minerals. Specific vitamins include: 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 Acid (Darabighane and Nahashon, 2014). The vitamins A, C, and E are responsible for the aloe's antioxidant activity while vitamin B and choline are involved in amino acid metabolism and vitamin B12 is required for the production and development of blood cells. Among the important minerals found in aloe vera are: calcium, chromium, copper, iron, magnesium, manganese, potassium, phosphorous, sodium and zinc (Mohammed, 2015). These minerals are essential for good health and are known to work in synergistic combinations with each other, with vitamins and other trace elements. Aside from vitamins and minerals, aloe vera is rich with enzymes (helps the breakdown of food sugars and fats), hormones (aid in healing and anti-inflammatory activities), sugars (i.e. glucose and fructose that provide anti-inflammatory activity), anthraquinones or phenolic compounds (aid absorption from gastro-intestinal tract and have antimicrobial and pain killing effects), lignin (increases the blood circulation), saponins (provide cleansing and antiseptic activity), sterols (antiseptic and analgesic), amino acids (basic building blocks of proteins in the production of muscle tissue), and salicylic acid (works as a pain killer) (Bernardn *et al.*, 2016). Although the use of aloe vera gel in broiler production has been documented, there is paucity of information on the influence of aloe vera powder on growth and cost benefit of broiler starter production, hence this research.

MATERIALS AND METHODS

The experiment was carried out at the poultry unit of the Animal Production Department, Federal College of Agriculture, Ishiagu, Ebonyi State. The aloe vera leaves that was used for the experiment was sourced from Ishiagu town and environment all within Ebonyi state. The aloe vera leaves were obtained fresh, washed, sliced into thinner/smaller parts and then sun-dried to get a crispy-like leafy material. The crispy leaves were then turned to powder by means of grinding and then incorporated into the diets of the birds at the levels of 0, 0.50, 1.00 and 1.50 % respectively.

Table 1: Experimental diet for broiler starter chickens fed graded levels of aloe vera powder (AVP)

	Treatments			
Ingredients	**T1**	**T2**	**T3**	**T4**
Maize	52.00	52.00	52.00	52.00
Wheat offal	7.25	7.00	6.90	6.70
Soya bean meal	6.60	6.50	6.40	6.30
Full fat soya	5.00	5.00	4.80	4.70
Groundnut cake	17.50	17.35	17.25	17.15
Fish meal (72%)	3.50	3.50	3.50	3.50
Blood meal	3.50	3.50	3.50	3.50
Aloe vera powder	0	0.50	1.00	1.50
Limestone	1.50	1.50	1.50	1.50
Bonemeal	2.00	2.00	2.00	2.00
Methionine	0.35	0.35	0.35	0.35
Lysine	0.20	0.20	0.20	0.20
Starter premix	0.35	0.35	0.35	0.35
Salt	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated value				
Crude protein (CP) (%)	23.50	23.42	23.29	23.18
MEnergy (Kcal/kg)	2872.50	2873.30	2872.50	2873.29
Crude fiber (%)	3.47	3.46	3.47	3.46
Ether extract (%)	4.55	4.52	4.50	4.48
Calcium (%)	1.25	1.29	1.30	1.30
Phosphorus (%)	0.48	0.48	0.48	0.48
Methionine (%)	0.72	0.72	0.72	0.72
Lysine (%)	1.30	1.30	1.30	1.30

Table 2: Proximate composition of Aloe vera leaf meal

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

The completely randomized design (CRD) was used. Ninety-six day old "Agritech" broiler chicks were used for the research work. Each treatment had twenty-four birds with three replicates consisting of eight birds each. Feed and water were given *ad-libitum* and vaccinations were given as at when due according to standard practices. The initial weight of the birds was taken at the beginning of the study and then subsequently on a weekly basis. Feed intake was also recorded as the difference between the quantity of feed given the previous day and the quantity that was left the next day. Feed conversion ratio was obtained as the ratio of feed intake divided by the body weight gain. Data collected were subjected to analysis of variance (ANOVA) according to procedure of Obi (2002). Significantly different means were separated according to the method of Duncan multiple range test. Proximate analysis of Aloe vera leaf meal was carried out using the standard procedure of AOAC (2005). Cost benefit analysis was calculated using the following formulas;

- **Cost of bird =** Amount expended or spent on purchase of bird
- **Cost per kg of feed** = Cost of feed/25kg
- **Cost of feed consumed** = Total feed intake x cost per kg of feed/1000
- **Other cost**
- **Total cost of production**
- **Revenue** = Average final Weight of birds x cost per kg of current market price of 1kg meat of broiler/1000
- **Benefit/Profit** = Revenue – cost of production
- **Cost benefit ratio** = Cost of production/Benefit

RESULTS AND DISCUSSION

The results obtained for growth performance and cost benefit analysis are displayed in table 3. The results showed that birds in treatment 1 (control) had a superior ($P<0.05$) final body weight of 725g which was significantly ($P<0.05$) higher than those obtained in treatments 4 and 3 with values of 708.33 g and 700.00 g respectively. While the least value of 667.86 g was obtained in treatment 2. The lower weight of birds fed the test diets compared to those fed the control diet can be attributed to the inclusion of effects of Aloe vera rather than quantities of feed ingested. This suggests that the aloe vera bioactives in the leaf meal has the potential to reduce weight of broiler birds. The result obtained in this study differ from the results obtained by Mmereole (2008) who reported higher final weights and body weight gains in broiler birds' fed diets was supplemented with aloe vera leaf meal. Similar results were obtained by Alemi *et al* (2012), where they obtained better growth performance in broilers treated with 0.75 % and 1 % aloe vera powder compared to the 0.50 % aloe vera powder group.

Daily feed intake value was also higher ($P<0.05$) in treatment 1 (59.52 g), which was followed closely by those in treatment 3 (59.13g) and 2 (58.92g), while birds in treatment 4 had the value of 58.69g. This could connote that aloe vera had substances within that repels the intake of feed as reflected in the daily feed intake values which include its taste and smell. The present results of feed intake agree with the report of Eevuri and Putturu (2013) who observed that Aloe vera supplementation in broiler ration decreased the feed intake. Result for feed conversion ratio revealed that birds in treatment 1 had the least value of 2.32, which is a reflection of the best

performed treatment. The highest value of 2.57 was obtained in treatment 2 which was significantly (P<0.05) different from those obtained in treatment 3 and 4 with values of 2.42 and 2.36, which were by themselves similar statistically. This was similar with those reported by Amaechi and Iheanetu (2014) who observed significant (P<0.05) differences in feed conversion ratio between groups treated with Aloe vera powder. Result for cost benefit analysis showed that as the level of aloe vera powder increased across the treatment, the benefit also increased. The highest (P<0.05) benefit/profit was obtained in treatment 4 with a value of ₦ 471.99, which differ significantly (P<0.05) from those in treatment 3, 2 and 1 with values of ₦ 460.68, ₦ 452.92 and ₦ 440.47 respectively. This was similar to the work carried out by Onyimonyi *et a*l. (2009), where they observed better cost benefit in treatments fortified with neem leaf meal in broiler chickens.

Table 3: Growth performance and cost benefit analysis of starter broiler birds fed supplemental levels of Aloe vera powder (Avp).

Parameters	Treatments				
	T1 (0%Avp)	T2 (0.50%Avp)	T3 (1.00%Avp)	T4 (1.50%Avp)	SEM
Initial body weight (g)	186.67	186.25	186.67	185.00	-
Final body weight (g)	725.00^{a}	667.86^{c}	700.00^{b}	708.33^{b}	12.55
Body weight gain (g)	538.33^{a}	481.61^{d}	513.33^{c}	523.33^{b}	6.36
Daily bodyweight gain (g)	25.64^{a}	22.93^{b}	24.44^{a}	24.92^{a}	0.38
Daily feed intake (g)	59.52	58.92	59.13	58.69	0.20
Feed conversion ratio	2.32^{b}	2.57^{a}	2.42^{b}	2.36^{b}	0.03
Cost of day old chick (₦)560	560	560	560	-	
Cost of kg of feed (₦)	279.62^{a}	272.43^{b}	265.22^{c}	258.02^{d}	2.47
Cost of feed consumed (₦)	349.53	337.08	329.32	318.01	
Other expenses (₦)	300	300	300	300	-
Total cost (₦)	1209.53	1197.08	1189.32	1178.01	
Revenue (₦)	1650	1650	1650	1650	-
Benefit/profit (₦)	440.47	452.92	460.68	471.99	
Cost benefit ratio	2.75	2.64	2.58	2.50	

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

Note: Avp = Aloe vera powder

CONCLUSION AND RECOMMENDATIONS

From the results obtained it can be concluded that the inclusion of Aloe vera powder in the diet of broiler starter chickens up to the level of 1.50% can be tolerated by the birds. This was established from the fact that there was no morbidity and mortality observed especially in the treatments fortified with the Aloe vera powder. I therefore would recommend that the Aloe vera powder should be used in the diets of other poultry birds like layers, turkey, duck, geese, quail etc to determine the impart and effect in other birds. Also, that other methods of processing should be adopted.

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