



RESEARCH PAPER

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Supplementing levels of *Aloe vera* gel in the drinking water of broilers

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Abstract

Poultry production now faces several environmental challenges, growth performance, immunity response, and the safety of poultry products. The study aimed to determine the growth performance and profitability of broilers given *Aloe vera* gel as a supplement in drinking water in terms of final weight, gain in weight, feed consumption/water consumption, feed conversion ratio, mortality rate, and profit above feed, medicine and stock cost for 35 days. Two hundred forty head day old broiler chicks were distributed at random in five treatments replicated six times following the Tukeys's (HSD) Test. The treatments used were: T₀- 2.5ml commercial antibiotic + electrolytes (Control); T₁- 2.5ml; T₂- 5.0ml; T₃- 7.5ml; T₄- 10ml *Aloe vera* gel per li of water. The supplementations of *Aloe vera* gel in the drinking water of broilers significantly affected the final weight, gain in weight, and feed conversion ratio but comparable performance to commercial antibiotic + electrolytes in terms of feed consumption, dressing percentage, and water consumption. The profit above feed, medicine, and cost of broilers as affected by *Aloe vera* gel was found comparable. Levels of *Aloe vera* gel at 2.5 to 10ml can be used as a supplement to drinking water on the growth performance of broilers as a substitute to commercial antibiotics.

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Introduction

The continuous use of in-feed antibiotics is suspected to result in increasing resistance of pathogens to antibiotics, the accumulation of antibiotic residues in animal products, the environment, and the imbalance of normal microflora. Thus, many researchers have found a way to substitute antibiotic growth promoters with possible alternative growth promoters. Phytogetic feed additives are good alternatives to replace antibiotic growth promoters in poultry (Jalal *et al.*, 2019). They have attracted attention because of their potential role and significant effect on animal production (Alloui and Agabou Alloui, 2014). The use of phytogetic feed additives derived from herbs, spices, plant extract, and other plant-derived substances (Steiner and Syed, 2015) in humans and animals is widespread. They are used as food coloring, flavoring, preservatives, digestive stimulant action, or antimicrobials. Improve or enhance production and as growth promotants in animal nutrition (Hashemi and Davoodi, 2011, Valenzuela-Grijalva *et al.*, 2017). Feed additives or phytochemicals also increase digestibility, reduce intestinal inflammatory, and stabilize intestinal health. They are used as multifunctional herbs such as feed additives or supplements for livestock and poultry to help in improving nutrient utilization, growth performance, immune response, intestinal micro-flora, controlling particular diseases, antimicrobial and anti-oxidative effects (Lillehoj *et al.*, 2018) such herb is *Aloe vera*.

A new class of medicinal herbs as additives to animal and poultry feeds have beneficial properties like anti-oxidant, anti-fungal, anti-microbial, anticoccidial, and immune-modulatory effects. Natural feed additives like *Aloe vera*, *Moringa oleifera*, cinnamon, tulsi, garlic, etc. This herbal preparation help in the digestion process and preparations are considered environment-friendly, cost-effective, and safe with no side effect (Vinus *et al.*, 2018).

Aloe vera (*Aloe barbadensis miller*) is found in tropical and sub-tropical climates characterized by properties such as anti-bacterial, anti-viral, anti-fungal, anti-tumor, anti-inflammatory, (Devaraj *et al.*,

2011) immunomodulatory, wound-healing, anti-diabetic and anti-oxidant effects (Babak and Nahashon, 2014; Darabighane Zarei *et al.*, 2011; Devaraj and Karpagam, 2011). It also contains 75 potentially active constituents: vitamins, enzymes, minerals, sugars, lignin, saponin, salicylic acids and amino acids (Surjushe *et al.*, 2008). The *Aloe vera* leaf gel contains about 98.5% to 99.5% water (Singh *et al.*, 2017, Bozzi *et al.*, 2007), 0.66% solid; soluble solid 0.56% with some seasonal fluctuation; on dry basis: 55% sugar; 17% minerals; 7% proteins; 4% lipids and 1% phenolic compounds (Ahlawat and Khatkar, 2014). *Aloe vera* latex has strong laxative effects and contains on a dry basis, an acid-insoluble resin with 16 to 33%, 24.5% significant ash content, and a small amount of essential oil and is said to be a safe natural and environmentally-friendly alternative solution to conventional synthetic preservatives (Christaki and Florou-Paneri, 2010).

Aloe vera can be used for broilers in the form of gel, powder, additive ethanolic extract, aqueous extract, and a polysaccharide contained in *Aloe vera* gel as an for broilers. *Aloe vera* can be an alternative to antibiotic growth promoters (Darabighane *et al.*, 2011, 2017) and has better results on growth performance, immune response, and coccidiosis in broiler chickens (Akram *et al.*, 2019; Tarig *et al.*, 2015).

Supplementation of *Aloe vera* in extract or ethanolic extract mixture can improve production performance and immune response in broilers. Amaechi and Oye 2014 cited that the dietary inclusion of *Aloe vera* in broiler diets and the inclusion of different levels is highly recommended and could be used as an alternative to antibiotic growth promoters in broilers. Similarly, dietary inclusion of 5 and 7.5g/kg *Aloe vera* can be effective as an alternative to in-feed antibiotics for broiler diets (Naghi Shokri *et al.*, 2017).

Material and methods

Research Design

The study was laid out using the Randomized Complete Block Design (RCBD). A total of two hundred forty head day-old broiler chicks were distributed at random in five treatments replicated six times.

The treatments used were:

T₀- 2.5ml Commercial antibiotic + electrolytes

T₁- 2.5ml *Aloe vera* gel/li of water

T₂- 5ml *Aloe vera* gel/li of water

T₃- 7.5ml *Aloe vera* gel/li of water

T₄- 10ml *Aloe vera* gel/li of water

Preparation of Aloe vera gel

Fresh *Aloe vera* was gathered from the Poultry project of Don Mariano Marcos Memorial State University – North La Union Campus, Bacnotan, La Union, Philippines where the research was conducted. *Aloe vera* was cleaned and washed with water. Remove the skin of *Aloe vera* and blend using an electric blender stocked in a clean container and store in a refrigerator. *Aloe vera* gel was added to plain water following the levels specific in each treatment from day 1 to 21 days, birds in the control group were provided with commercial antibiotics containing chlortetracycline/hydrochloride, vitamin A + B12 for a brooding period (1 to 14 days) and electrolytes containing niacinamide, magnesium chloride, potassium chloride, sodium acetate, sodium chloride and glucose in the drinking water for 7 days. Water consumption was recorded.

Broiler Ration

a. Commercial Chick Booster- for 14 days

b. Commercial Starter Crumble- for 15-35 days

The aloe gel was added to the drinking water as a supplement following the specific levels for each treatment.

Preparation of Experimental Cages and Management Practices

The cages were cleaned by brushing the walls and flooring with soap and water and then disinfected to prevent the growth and multiplication of disease-causing microorganisms. Cages were left for seven days to eliminate the odor. The cages were installed with electric bulbs as a source of heat during the two weeks of brooding period. The sides of the cages were covered with clean empty sacks to maintain the proper temperature and to prevent the birds from exposure to draft while the floors were placed with

rice hull as beddings which were changed every other day. Strict hygiene and sanitation were properly imposed and observed throughout the experiment.

The data gathered were the following;

1. *Final weight (kg)*. This was taken by weighing the bird at 35 days old.

2. *Gain in weight (kg)*. This was taken by subtracting the initial weight of birds from the final weight.

3. *Feed Consumption (kg)*. This was obtained by summing up the daily feed intake of broilers from a day old to 35 days.

4. *Water Consumption (li)*. This was taken by summing up the total amount of water consumed from brooding to 35 days.

5. *Dressing Percentage (%)*. This was obtained by dividing the dressed weight by the birds' live weight, multiplied by 100.

$$DP (\%) = \frac{\text{Dressed Weight (kg)}}{\text{Live weight (kg)}} \times 100$$

6. *Feed Conversion Ratio*. This was computed by dividing the total amount of feed consumed by the total gain in weight.

$$FCR = \frac{\text{Total Feed Consumed}}{\text{Total Gain in Weight of birds}}$$

7. *Profit above feed, supplement, and stock cost (P)*. This was taken by subtracting the cost of feed, medicine, and stock from the sale value of birds at the end of the study

Data Analysis

Data gathered were analyzed using Analysis of Variance in Randomized Complete Block Design and significant differences among treatment means were further tested using the Tukeys's Honest Significant Difference (HSD) Test.

Result and discussion

Growth Performance of Broilers

Final weight

The final weight of broilers is presented in Table 1. Analysis of variance revealed significant results. Birds given *Aloe vera* gel at varying levels performed comparably in terms of final weight (1.44 to 1.48kg), significantly heavier than those birds given commercial antibiotics + electrolytes (1.24kg).

The result implies that the addition of *Aloe vera* gel as a supplement in the drinking water significantly increased the final weight of broilers. The result corroborates with the findings of Shokraneh, Ghalamkari, Toghiani, and Landy, 2016, that giving *Aloe vera* gel in drinking water improves the body weight of broilers wherein *Aloe vera* contains active components like vitamins, enzymes, minerals, sugars, and fatty acids that helps to improve the growth performance of broilers (Surjushe *et al.*, 2008, Amaechi *et al.*, 2014).

Table 1. Final weight and gain in weight of broilers as affected by *Aloe vera* gel as a supplement in the drinking water.

Treatment	Final Weight (kg)	Gain in Weight (kg)
Commercial antibiotic + electrolytes	1.24 ^b	1.20 ^b
2.5ml <i>Aloe vera</i> gel/li water	1.48 ^a	1.45 ^a
5ml <i>Aloe vera</i> gel/li water	1.47 ^{ab}	1.43 ^{ab}
7.5ml <i>Aloe vera</i> gel/li water	1.47 ^{ab}	1.43 ^{ab}
10ml <i>Aloe vera</i> gel/li water	1.44 ^{ab}	1.40 ^{ab}
Significance	*	*
cv	7.17%	7.38%

**All means followed by the same letter are not significantly different at 0.01 levels Tukeys (HSD) Test

Gain in weight

The total gain in weight of broilers as affected by *Aloe vera* gel is shown in Table 1. Birds given *Aloe vera* gel had the heaviest weight (1.40 to 1.45kg) and the lowest were those birds given commercial antibiotic + electrolytes (1.20kg). Analysis of variance revealed a significant difference. Comparison among treatment means showed that broilers given 2.5ml to 10ml *Aloe vera* gel per liter of water gained the heaviest weight as compared to a control group. The result of the present study is in agreement with the findings of Dela Cruz, 2015 that the gain in weight of broilers was significantly affected by *Aloe vera* gel supplementation given 5ml to 20ml per gallon of water. The use of *Aloe vera* gel in broilers enhances the growth performance, improves intestinal health, immune system response, and growth performance, and could be a simple mechanism to reduce the feed cost of broilers (Mohammed 2015, Motawae 2017 and Singh *et al.*, 2017). Results also obtained by Mmereole, 2011 that birds supplemented with *Aloe*

vera were significantly heavier ($p > 0.05$), and concluded that *Aloe vera* can replace antibiotics as growth promoters.

Feed consumption

As shown in Table 2, the feed consumption of broilers as affected by *Aloe vera* gel ranges from 2.60 to 2.73kg. The analysis of variance disclosed no significant result. The result implies that the beneficial ingredients found in *Aloe vera* gel did not influence the feed consumption of broilers. The result coincides with the findings of Mehala and Moorthy 2008 in their study on the inclusion of *Aloe vera*, Curcuma longa, and their combinations as feed additives to broilers, and no significant differences were found in the feed consumption of birds.

Feed conversion ratio

Better feed conversion ratio and greater body weight are important goals in broiler production (Singh, 2019, Babak *et al.*, 2014). A kilogram of feeds consumed to produce a kilo gain in weight is presented in Table 2. Birds given 10ml *Aloe vera* gel are more efficient as compared to those birds given antibiotic + electrolytes (control group). Analysis of variance revealed significant results. The antibacterial properties in *Aloe vera* improved broilers' immune response, thus improving the growth performance and feed conversion ratio (Yadav *et al.*, 2017; Singh *et al.*, 2017; Islam, 2017).

Table 2. Feed consumption and feed conversion ratio of broilers as affected by *Aloe vera* gel as a supplement in the drinking water.

Treatment	Feed Consumption (kg)	Feed Conversion Ratio
Commercial antibiotic + Electrolytes	2.64	2.21 ^a
2.5ml <i>Aloe vera</i> gel/li water	2.73	1.90 ^{ab}
5ml <i>Aloe vera</i> gel/li water	2.67	1.87 ^{ab}
7.5ml <i>Aloe vera</i> gel/li water	2.66	1.87 ^b
10ml <i>Aloe vera</i> gel/li water	2.60	1.86 ^b
Significance	ns	*
cv	3.98%	7.73%

**All means followed by the same letter are not significantly different at 0.01 level Tukeys (HSD) Test

Dressing percentage

Data on the dressing percentage of broilers is presented in Table 3. The dressing percentage per bird ranges from 69.28% to 73.27%. The analysis of variance revealed insignificant results. The result of the present study implies that supplementation of *Aloe vera* gel in the drinking water of broilers did not affect the dressing percentage. The present study is in agreement with the findings of Singh *et al.*, 2013 that no significant differences were found in the effects of *Aloe vera* on hemato-biochemical parameters and dressing percentage on broiler chickens.

Table 3. Dressing percentage and water consumption of broilers as affected by *Aloe vera* gel in the drinking water of broilers.

Treatment	Dressing Percentage (%)	Water Consumption (li)
Commercial antibiotic + electrolytes	70.27	1.62
2.5ml <i>Aloe vera</i> gel/li water	72.03	1.66
5ml <i>Aloe vera</i> gel/li water	73.27	1.64
7.5ml <i>Aloe vera</i> gel/li water	71.92	1.64
10ml <i>Aloe vera</i> gel/li water	69.28	1.62
Significance	ns	ns
cv	4.43%	6.08%

Water consumption

Table 3 presents the water consumption as affected by *Aloe vera* gel in the drinking water of broilers. The water consumption ranges from 1.62 to 1.66 liters per head for 35 days. The analysis of variance revealed no significant differences. The present study confirms the study of Durrani *et al.*, 2008, that the efficacy of 10% (w/v) at 5,10, and 15ml/li of water *Aloe vera* gel in the drinking water did not affect the water consumption of broilers.

Profit above Feed Medicine and Stock Cost

Profit above the feed, medicine, and stock cost of broilers ranges from P 35.30 to P 40.80 (Table 4). The analysis of variance revealed insignificant results. Improving feed efficiency is usually associated with improved profitability. The active ingredients present in *Aloe vera* improve gut function in animals leading to better

production, better carcass characteristics, optimized digestion, and increased profit (Animal Nutrition: Benefits of *Aloe vera*, 2014). Broilers given different levels of *Aloe vera* extract are better profit as compared to the commercial antibiotic + electrolytes, however, the result of the present study did not affect the profit above feed, medicine, and stock cost of broilers.

Table 4. Profit above feed, medicine, and stock cost of broilers as affected by *Aloe vera* gel in the drinking water (PhP).

Treatment	Profit (PhP)
Commercial antibiotic + electrolytes	35.30
2.5ml <i>Aloe vera</i> gel/li water	40.80
5ml <i>Aloe vera</i> gel/li water	39.49
7.5ml <i>Aloe vera</i> gel/li water	39.60
10ml <i>Aloe vera</i> gel/li water	39.06
Significance	ns
cv	10.19%

Conclusion

Based on the result of the study, the following conclusions were derived:

1. Supplementations of *Aloe vera* extract in the drinking water of broilers significantly affected the final weight, gain in weight, and feed conversion ratio but comparable performance to commercial antibiotics in terms of feed consumption, dressing percentage, and water consumption.
2. The profit above the feed, medicine, and cost of broilers as affected by *Aloe vera* extract was found comparable.

Recommendation(S)

Levels of *Aloe vera* extract at 2.5 to 10ml per liter of water can be used as a supplement to the drinking water of broilers on the growth performance of broilers as a substitute to commercial antibiotics.

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