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ORIGINAL ARTICLE

Effect of *Aloe vera* Leaf Extract on Performance Parameters in Broiler Birds

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ABSTRACT
To evaluate and compare the effects of Aloe vera Leaf Extract (ALE) with antibiotic growth promoter on performance parameters of broiler birds. The experiment involved 90 broilers (Ven Cobb 400 strain) which were used on complete randomized design in 3 groups with 3 replicates, each consisting of 10 broilers. The groups included Control group (T1) received only basal diet; standard group (T2) received basal diet mixed with antibiotic growth promoter and treatment group (T3) was fed with basal diet and administered with ALE at the dose rate of 50 mg/L in drinking water daily. The experiment was carried out for 42 days and following performances Parameters were studied: Body Weight, Body weight gain, Feed intake and Feed conversion ratio. All the data collected were subjected to analysis of variance (ANOVA). Results showed Significant differences (P<0.01) were observed in all performance parameters between the control and groups treated with ALE, antibiotic growth promoter (BMD). Aloe Vera extract when used at 5o mg/L in drinking water is more efficient in improving broiler performance than antibiotic growth promoter (BMD) without any deleterious effect on the overall health status of the birds.
Keywords: Aloe vera, BMD, T2, T3

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INTRODUCTION

Antibiotic Growth Promoter (AGP) has been widely used in poultry industry for improving production and performance. Sub therapeutic use of antibiotics as a growth promoter caused development of resistance to antibiotics and transfer of these antibiotic resistance genes from animal to human micro biota. This led to withdrawal of antibiotics as growth promoters in the European Union since January 1, 2006 [1]. Bacterial resistance can be transferred to human population by consuming poultry meat treated with growth promoter. The development of antibiotic resistance among bacteria has now become a major public concerns as they have seriously affected available treatment against them [2]. There is need to find alternative to overcome this disadvantages with improving production and performance. From many years plants has been used as alternative for synthetic drugs. *Aloe vera (Aloe barbadensis)* is one such medicinal herb having antimicrobial, antiseptic, analgesic, immune-stimulatory [3] anti-inflammatory [4], antioxidant [5], and various other properties without any adverse effect like those found with synthetic drugs. Little work has been done on the efficiency of *Aloe vera* for improving the production performance of broilers. Hence, the present study was undertaken to compare the effects of *Aloe vera* with antibiotic growth promoter on performance parameters of broiler birds

MATERIALS AND METHODS

Aloe vera plants were procured from the department of Medicinal and Aromatic plant Sciences, Mahatma Phule Agriculture University, MPKV, Rahuri (Maharashtra) was botanically identified in and identified by Department of Botany, Govt. V.Y.T.P.G. Autonomous College, Durg, and (C.G.). *Aloe vera* leaves (40 kg) on shade drying and powdering yielded about 1kg of powdered material. Extraction of 100 g of dried leaf powder with 50% methanol by cold maceration yielded about 4.5 g of extract. The extract thus obtained is hereby referred as *Aloe vera* leaf hydroalcoholic extract (ALE). This ALE was water soluble. The yield of ALE on the basis of dried leaf powder was 4.5% and on the basis of fresh leaves was 0.125%.

Day old Ven Cobb 400 strain broiler chicks (n=90) from the same hatch were procured from local hatchery. Chicks were individually weighed and were randomly assigned to three treatment groups, each group containing 3 replicates with 10 chicks each. The treatment groups were: Control group (T1) received only basal diet; standard group (T2) received basal diet mixed with antibiotic growth promoter and treatment group (T3) was fed with basal diet and administered with ALE at the dose rate of 50 mg/L in drinking water daily for 42 days. The broiler pre starter, starter and finisher diets were fed ad libitum to the birds. All the chicks were reared on deep litter system with standard management conditions throughout the experimental period of 42 Days.

Body weight and feed consumption were weekly recorded throughout the study. On basis of this data weekly Body Weight Gain, Cumulative Body Weight Gain, Cumulative feed consumption, Feed conversion ratio (feed/gain), Cumulative Feed Conversion Ratio were calculated.

The toxicity signs mortality, if any from 1-42 day was recorded.

Statistical analysis:

The body weight, feed consumption and feed conversion data of different groups from study was compared with control group using GraphPad Prism Software Version 4, 2003. Statistically significant differences were reported.

RESULTS

Table 1 show the effect of dietary treatments on mean live weights of birds. Body weight of group T3 and T2 were significantly ($p<0.01$) higher from 2nd to 6th week as compared to T1 group. Also there was significant difference ($p<0.01$) in live weights of group T3 and T2 during 3rd, 5th and 6th week of age. At the end of 6th week, the average live weight of T3 (ALE treated) group (2476.27 ± 18.61g) was significantly higher ($P<0.01$) as compared to control (2038.90 ± 24.15g) and standard (2236.30 **±** 16.46g) groups. Also, group T2 had significantly higher body weight as compared to T1. Table 1 data also shows birds of group T3 showed significantly higher body weight gains from second week to fifth week of age as compared to the birds of T1 group. The birds of group T2 showed statistically similar weight gain to group T1 except in third week. The birds of group T3 exhibited highest body weight gain of 598.38 ± 12.22 g at the end of 5th week, while the birds of group T1 and T2 showed highest body weight gain 438.31 ± 5.41g and 492.60 ± 6.88g, respectively, at the end of 4th week.

The average weekly feed consumption (Table 2) in birds of group T3 was significantly ($P<0.01$) higher as compared to group T1 during second, third, fourth, and fifth week of age, but was almost similar to group T2 except during fifth week where feed consumption of group T3 was significantly higher ($P<0.01$) as compared to group T2.

In table 3 birds of group T3 Supplemented with ALE (50mg/L) showed significantly ($P<0.01$) lower feed conversion ratio as compared with group T1 in all weeks except at first week. The weekly FCR of group T3 at different weeks was statistically similar to group T2. However, weekly FCR of group T2 was significantly ($P<0.01$) lower than T1 at fourth and fifth week of age.

The average cumulative feed consumption (Table 4) at end of experiment was 3818.28 ± 23.85g in control, 3874.49 ± 25.30g in AGP treated and 4100 ± 12.39g in ALE treated group. Group T3 showed significantly ($P<0.01$) higher cumulative feed consumption as compared to groups T1 and T2**.** Data shows the average cumulative FCR of birds of group T3 (1.68 ± 0.05) at sixth week was significantly lower ($P<0.01$) as compared to T1 (1.91 ± 0.083) and T2 (1.76 ± 0.06). The birds of group T3 Supplemented with ALE (50mg) resulted in significantly ($P<0.01$) lower feed conversion ratio as compared with group T1 in all weeks except at first week. The average cumulative weekly FCR of group T3 at first, second and fourth weeks were statistically similar to group T2. However, weekly FCR of group T2 was significantly ($P<0.01$) lower than T1 in all weeks except first and second week of age.

DISCUSSION

According to the results obtained it can be seen that the ALE treated group showed increased feed intake compared to the standard group and control group and this leads to increased body weight in these groups. Amaechi and Iheanetu [5] found that *Aloe vera* powder when used at 1.5% are more efficient than antibiotic growth promoter (Enramycin) in improving broiler performance and decreasing intestinal *Escherichia coli* and *Salmonella spp.* and could be successfully used to substitute antibiotic growth promoters in broiler diets. He also stated that since the main polysaccharide contained in *Aloe vera* is acemannan, the enhanced body weight gain in groups treated by *Aloe vera* powdered compared to the control group may be attributed to anti-bacterial properties of *Aloe vera* which can improve intestinal micro flora. Furthermore, the acemannan contained in *Aloe vera* can stimulate immune system and improve body resistance against bacteria and viruses. This in turn, improves growth performance. Bolu *et al.* [6] stated that increased feed intake in *Aloe vera* gel groups can be attributed to changes in taste and stimulated appetite. Darabighane *et al*. [7] found *Aloe vera* gel groups at 2 % *Aloe vera* gel groups had the largest villus height. *Aloe vera* gel groups consumed more feed compared to antibiotic group both in the growing period (25 to 42 days) and during total period of investigation (day 0 to 42).

The present observations are in conformity with the report of Mmereole [2] who fed 1% *Aloe vera* as dietary supplementation of broiler diet. Result obtained by him indicated that body weights and body weight gains were significantly higher in the birds fed diet containing *Aloe vera* supplement than the birds fed control diet. The results of present study was also in agreement with Odo *et al*. [9] who fed 5% and 10% dietary supplementation of *Aloe vera* in cockerel diet and reported significantly higher ($P<0.05$) weight gain and lower feed conversion ratio within treatment groups. Kumar *et al*. [16] also obtained similar results when they compared the body weights and body weight gains of the birds fed *Aloe vera* feed supplement and those fed on diets containing antibiotic growth promoter. These results appear to confirm the observations made by Mehala and Moorthy [10] who observed that 1% dietary supplementation of *Aloe vera* leaf meal had significant **(**$P< 0.05$) higher body weights and body weight gains as compared to control diet.

Improvement in the body weight of the broiler birds in present study may be due to phenolic compounds found in the sap of *Aloe vera* plant. The bitter aloes consist of free anthraquinones and their derivatives like aloe-emodin-9-anthrone, isobarbaloin, anthrone-C-glycosides and chromones. These compounds exert a powerful purgative effect, but when smaller they appear to aid absorption from the gut and are potent antimicrobial agents. [11, 12].

Better growth performance and favourable feed conversion ratio (FCR) with the group T3 may be attributed to the anti-bacterial and anti-oxidant properties of *Aloe vera* reported by Arunkumar and Muthuselvam [13] and Rajasekaran *et al.* [17].

A more balanced biota population in the gastrointestinal tract of poultry could lead to a greater efficiency in digestibility and utilization of food, resulting in an enhanced growth and improved FCR [14]. The improved feed conversion ratio seen in these findings may be explained as follows: antibiotic growth promoters reduce level of competition between the microorganisms for nutritional substances and the host. They also increase absorption and consumption of nutritional compounds by thinning intestinal wall [18]. Moreover, expulsion of pathogenic organisms from the gut by the beneficial ones most likely conferred better absorption of nutrients on the birds and hence enhanced the bird's ability to convert feed.

Increase in the body weight of the broiler birds in present study may be due to biochemical catalysts, such as amylase and lipase which can aid digestion by breaking down fats and sugars. Improved feed intake and body weight gain in present investigation may be attributed to the facts that improved digestion of feed by simulation of digestive enzyme, as phytogenic feed additives are reported to improve performance by enhancing the activity of digestive enzymes [15]. In support of above findings, Wenk [20]; Samarasinghe *et al.* [19] both stated that herbs can stimulate appetite and endogenous secretions which, in turn, improve performance of the body.

Furthermore, *Aloe vera* has been found to contain several beneficial ingredients, including vitamins, minerals, organic acids, and carbohydrates [21] that could influence body weight gain in *Aloe vera* supplemented chickens.

Table No. 1 Effect of supplementation of *Aloe vera* leaf extract (ALE) on Average Weekly Live Weight and Average Weekly Body Weight Gain in broiler birds

Age	Group/Treatment					
	Control (T1)		Standard (T2)		ALE (T3)	
	Body Weight	Weight Gain	Body Weight	Weight Gain	Body Weight	Weight Gain
0 day	46.44 ± 0.44	132.27 ±0.76	46.4 ± 0.21	144.73 ±0.63	46.61 ± 0.56	147.17 ±3.12
7 day	178.72 ± 0.34^{b}	275.81 ±2.96^{b}	**191.18** ± 0.83^{a}	301.16 ±2.10^{b}	**193.79** ± 2.63^{a}	**328.92** ±3.31^{a}
14 day	454.52 ± 2.79^{b}	370.97 ±2.29^{b}	**492.34** ± 1.70^{a}	**412.55** ±6.17^{a}	**522.71** ± 5.60^{a}	**430.85** ±3.54^{a}
21 day	825.50 ± 2.09^{c}	438.31 ±5.40^{b}	**904.9** ± 6.55^{b}	492.60 ±6.88^{ab}	**953.56** ± 9.69^{a}	**511.85** ±6.45^{a}
28 day	1263.82 ± 16.15^{b}	413.95 ±9.48^{b}	**1397.50** ± 13.31^{a}	483.59 ±5.98^{b}	**1465.70** ± 8.56^{a}	**598.38** ±12.22^{a}
35 day	1677.77 ± 11.91^{c}	361.13 ±13.09	**1881.10** ± 15.05^{b}	355.2 ±12.45	**2063.4** ±10.85^{a}	412.46 ±13.15
42 day	2038.90 ± 24.15^{c}		**2236.30 ±** 16.46^{b}		**2476.27** ± 18.61^{a}	

N= 30, **a-c:** Overall mean with different superscript in the same column are significantly different from each other (P<0.01).

Table No. 2 Effect of Supplementation of ALE on average weekly feed intake and weight gain in broilers birds

Age	Group/Treatment					
	Control (T1)		Standard (T2)		ALE (T3)	
	Feed Intake	Weight Gain	Feed Consumed	Weight Gain	Feed Consumed	Weight Gain
7 day	173.26 ±2.93	132.27 ±0.76	178.35 ±2.13	144.73 ±0.63	182.92 ±1.36	147.17 ±3.12
14 day	394.37 ±3.84^{b}	275.81 ±2.96^{b}	417.30 ±2.23^{ab}	301.16 ±2.10^{b}	**432.60** ±4.05^{a}	**328.92** ±3.31^{a}
21 day	573.4 ±3.55^{b}	370.97 ±2.29^{b}	613.26 ±8.15^{ab}	**412.55** ±6.17^{a}	**623.13** ±3.01^{a}	**430.85** ±3.54^{a}
28 day	825.68 ±6.42^{b}	438.31 ±5.40^{b}	887.68 ±8.84^{ab}	492.60 ±6.88^{ab}	**903.49** ±7.88^{a}	**511.85** ±6.45^{a}
35 day	967.06 ±8.01^{b}	413.95 ±9.48^{b}	982.68 ±10.29^{b}	483.59 ±5.98^{b}	**1109.25** ±5.48^{a}	**598.38** ±12.22^{a}
42 day	884.50 ±18.06	361.13 ±13.09	795.2 ±21.56	355.2 ±12.45	848.93 ±17.38	412.46 ±13.15

N= 30, **a-c:** Overall mean with different superscript in the same column are significantly different from each other (P<0.01).

Table No. 3 Effect of supplementation of ALE on average weekly FCR in broiler birds

Age	Group/Treatment		
	Control (T1)	Standard (T2)	ALE (T3)
7 day	1.31 ±0.02	1.23 ±0.01	1.24 ±0.03
14 day	1.43 ±0.01^{a}	1.38 ±0.07^{ab}	**1.31** ±0.02^{b}
21 day	1.54±0.01^{a}	1.48 ±0.01^{ab}	**1.44**±0.025^{b}
28 day	1.88 ±0.02^{a}	**1.80** ±0.06^{b}	**1.76** ±0.015^{b}
35 day	2.34 ±0.035^{a}	**2.03** ±0.08^{b}	**1.85** ±0.035^{b}
42 day	2.45 ±0.043^{a}	2.24 ±0.029^{ab}	**2.06** ±0.025^{b}

N= 30, a-c: Overall mean with different superscript in the same column are significantly different from each other (P<0.01).

Table No. 4 Effect of supplementation of ALE on Average Weekly cumulative Feed Consumption and cumulative body weight gain.

Age	Group/Treatment					
	Control (T1)		Standard (T2)		ALE (T3)	
	Cumm. Feed Intake	Cumm. Weight Gain	Cumm. Feed Intake	Cumm. Weight Gain	Cumm. Feed Intake	Cumm. Weight Gain
7 day	173.26 ± 2.93	132.27 ± 0.76	178.35 ± 2.13	144.74 ± 0.63	182.92 ± 1.36	147.17 ± 3.12
14 day	567.63 ± 6.76^{b}	408.08 ± 2.77^{b}	595.66 ± 1.02^{ab}	**445.90** ± 1.70^{a}	**615.53** ± 2.80^{a}	**476.10** ± 5.93^{a}
21 day	1141.04 ± 3.30^{b}	779.05 ± 3.73^{c}	**1208.93** ± 7.21^{a}	**858.46** ± 6.35^{b}	**1238.66** ± 2.34^{a}	**906.95** ± 3.20^{a}
28 day	1966.72 ± 3.89^{b}	1217.37 ± 5.77^{b}	**2096.61** ± 15.45^{a}	**1351.06** ± 13.12^{a}	**2142.16** ± 5.71^{a}	**1418.81** ± 9.12^{a}
35 day	2933.78 ± 8.00^{c}	1631.32 ± 11.51^{c}	**3079.29** ± 18.77^{b}	**1834.66** ± 14.84^{b}	**3251.41** ± 9.38^{a}	**2017.19** ± 10.92^{a}
42 day	3818.28 ± 23.85^{b}	1992.45 ± 23.71^{c}	3874.49 ± 25.30^{b}	**2189.86** ± 16.31^{b}	**4100** ± 12.39^{a}	**2429.65** ± 18.27^{a}

N= 30, **a-c:** Overall mean with different superscript in the same column are significantly different from each other (P<0.01).

Table No. 5 Effect of supplementation of ALE on Average weekly Cumulative FCR in broiler birds

Age	Group/Treatment		
	Control (T1)	Standard (T2)	ALE(T3)
1 week	1.31 ± 0.02	1.23 ± 0.016	1.24 ± 0.036
2 week	1.39 ± 0.03^{a}	1.33 ± 0.02^{ab}	1.29± 0.01^{b}
3 week	1.46 ± 0.041^{a}	1.40 ± 0.05^{b}	1.36 ± 0.07^{c}
4 week	1.61 ± 0.01^{a}	1.55 ± 0.03^{b}	1.51 ± 0.01^{b}
5 week	1.79 ± 0.09^{a}	1.67 ± 0.04^{b}	1.61 ± 0.08^{c}
6 week	1.91 ± 0.08^{a}	1.76 ± 0.06^{b}	1.68 ± 0.05^{c}

N= 30, **a-c:** Overall mean with different superscript in the same column are significantly different from each other (P<0.01).

CONCLUSION

The result of the present findings indicates supplementation of *Aloe vera* leaf Extract @50mg/L in drinking water is effective in improving growth performance of broiler birds which is evidenced by increased overall live weight, body weight gain, feed consumption and reduced FCR.

REFERENCES

1. Castanon J. I. R. (2007). History of the Use of Antibiotic as Growth Promoters in European Poultry Feeds, Poultry Science, 86 (11): 2466-2471.
2. Mmereole, F.U.C. (2011). Evaluation of the Dietary inclusion of Aloe vera as an alternative to antibiotic growth promoter in broiler Production. Pakistan journal of Nutrition 10 (1): 1-5.
3. Sharma, P., Kharkwal, A. C., Kharkwal, H., Abdin, M. Z. and Verma, A. (2014). A Review on Pharmacological properties of Aloe vera Int. J. Pharm. Sci. Rev. Res., 29(2): 31-37
4. Langmead, L., Makins, R.J. and Rampton, D.S. (2004). Anti-inflammatory effects of Aloe vera gel in human colorectal mucosa in vitro. Aliment Pharmacol. Ther. 19: 521-527.
5. El-Shemy, H.A., Aboul-Soud, M.A., Nassr-Allah, A.A., Aboul-Enein, K.M., Kabash, A. and Yagi, A. (2010). Antitumor properties and modulation of antioxidant enzyme's activity by Aloe vera leaf active principles isolated via supercritical carbon dioxide extraction. Curr Med Chem. 17(2): 129-38.
6. Amaechi, N. and Iheanetu, E. (2014). Evaluation of dietary supplementation of broiler chicks with different levels of Aloe vera as a replacement for antibiotic growth promoter on broiler production in the humid tropics. Inter. J. Vet. Sci. 3(2): 68-73.
7. Bolu, S.A., Babalola, T.O., Elelu, N., Ahmed, R.N., Oyetunde, S.A., Ademola, P.F. and Jiddah, S.A. (2013). Effect of supplemental Aloe vera gel in drinking water on some performance histology, hematology, serum constituents and growth of turkey poults challenged with Escherichia coli. Wudpecker Journals, 2(8): 223-229.

8. Darabighane, B., Zarei, A., Shahneh, A.Z. and Mahdavi, A. (2011). Effects of different levels of Aloe vera gel as an alternative to antibiotic on performance and ileum morphology in broilers. Ital. J. Anim. Sci. 10: 30-36.
9. Odo, B.I., Ekenyem, B.U. and Nwamo, A.C. (2010). Effects of Aloe vera as leaf protein concentrate on growth performance of cockerels. Int. J. Poult. Sci. 9(5): 426-428.
10. Mahela, C. and Moorthy, M. (2008). Production Performance of Broilers fed with Aloe vera and Curcuma longa (Turmeric). International J. Poult. Sci. 7 : 852-856.
11. Lorenzetti, L. J., Salisbury, R., Beal, J. L. and Baldwin.(1964). Bacteriostatic property of Aloevera. Journal of the Pharmaceutical Society. 53: 1287-1290.
12. Sims, P., Ruth, M. and Zimmerman, E.R. (1971). Effect of Aloe vera on Herpes simplex and herpes virus (strain Zoster). Aloe vera of American Archives. 1: 239-240.
13. Arunkumar, S. and Muthuselvan, M. (2009). Analysis of phytochemical constituents and antimicrobial activities of Aloe vera L. against clinical pathogens. World J. of Agricultural Sci. 5(5): 572-576.
14. Bedford, M. (2000). Removal of antibiotic growth promoters from poultry diets. World Poult. Sci. J. 56: 347-365.Benjamin, M.N. 1978. Outline of Veterinary Clinical Pathology. University Press, IOWA, USA, pp: 229-232.
15. Recoquillay, F. 2006. Active plant extracts show promise in poultry production. Poult. Int. 45(2):28-31.
16. Kumar, M., Choudhary, R. S. and Vaishnar, J. K. 2005. Effect of supplemented prebiotic, probiotic and turmeric in diet on the diet of broiler chicks during summer. Ind. J. Poult. Sci., 40: 137-151
17. Rajasekaran, S., Sivagnanam, K and Subramanian, S. (2005). Antioxidant effect of Aloe vera gel extract in streptozotocin-induced diabetes in rats. Pharmacological Repots. 57 : 90-96.
18. Amaechi, N. and Anueyiagu, C. F. (2012). The effect of dietary benzoic acid supplementation on growth performance and intestinal wall morphology of broilers. Online J. Anim. Feed Res. 1: 401-404.
19. Samarasinghe, K., Wenk, C., Silva, K.F.S.T., Gunasekera, J.M.D.M. (2003). Turmeric (Curcuma longa) root powder and mannan-oligosaccharides as alternatives to antibiotics in broiler chicken diet. Asian-Aust. J. Anim. Sci. 16:1495 - 1500.
20. Wenk, C. (2002). Herbs, botanicals and other related substances. pp 1-10 in Proc. 11th Eur. Poultry Conf., Bremen, Germany.
21. Boudreau, M.D. and Beland, F.A. (2006). An evaluation of the biological and toxicological properties of Aloe barbadensis (miller), Aloe vera. Journal of Environmental Science and Health. Part C, Environmental Carcinogenesis and Ecotoxicology, 24 (1):103–154.