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Article

Effects of aloe vera extract in drinking water on broiler performance

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Abstract: This experiment was conducted to evaluate the effects of dietary supplementation of aloe vera extract (w/v) on growth performance of broiler. The present study explored the potentials of medicinal plants *Aloe barbedensis* mixture in broiler performance. For this purpose, 120 day old chicks were randomly assigned into five treatment groups, namely T_0, T_1, T_2, T_3 and T_4. Each treatment group contained 24 chicks. The chicks were purchased from a local chick hatchery named Nourish Poultry & Hatchery Ltd. Birds were brooded up to 10 days and then reared in separate flock for 35 days in an open sided house. Each treatment group was further replicated into three sub-groups and each contained eight birds. Experimental birds in T_1, T_2, T_3 and T_4 were provided with aloe vera extract (w/v) @ 05, 10, 15 and 20 ml per liter of drinking water while T_0 was maintained as control group. Relevant data were recorded throughout the experimental period and subjected to statistical analysis. The data on growth parameters (body weight gain, feed consumption, feed efficiency, water intake) and feed cost and gross return per broiler were evaluated. The results of the study revealed that the aloe vera supplemented groups showed higher live weight gain than untreated group. Aloe vera supplemented groups showed more live weight gain in the terminal stages of the experiment. Aloe vera (w/v) extract supplemented groups performed the best feed efficiency. The live weight gain and feed efficiency were significantly ($P<0.05$) better in the broilers provided water containing 15 ml/L aloe vera aqueous extract. Water intake, feed intake and abdominal fat deposition of broilers given aloe extract in drinking water were not different among each other. So, 15 ml/L aloe vera aqueous extract may be given to the broilers drinking water.

Keywords: aloe vera extract; broilers; growth performance

1. Introduction

Broiler is an efficient feed converter into poultry meat in only 35 days, giving a quick return of investment that would allow 5-6 production cycles in a year. Broilers clearly dominate the world poultry consumption contributing about 70 % to the world poultry market (Roenick, 1998). The frequent use of drugs as feed additives in poultry ration resulted in resistant to pathogenic microorganism, affecting the feed efficiency and growth performance of poultry birds. Therefore, the scientists has been giving their attention on medicinal plants (like aloe vera, neem, mulberry leaves etc.) to achieve the targeted nutritional and health status of poultry. The consumption and demand for medicinal plants have been adopted in many countries because of low cost,

easy availability, affordability for a common farmer, good antimicrobial natured, reduced diseases associated risks, lowering blood cholesterol level and diversified functions in improving performance, growth rate, feed efficiency and weight gain in birds. Aloe vera (*Aloe barbadensis*) is one of the semi-tropical house plant under lily family has a long and illustrious history dating from biblical times. It has been mentioned throughout recorded history and given a high ranking as an all-purpose herbal plant. There are over 250 species of aloe grown around the world. However, only two species are grown today commercially, with *Aloe barbadensis* and *Aloe aborescens* being the most popular. Leaves are the main part, which contains most of these compounds (Volger *et al.,* 1999). Locally aloe vera is known as "Ghritokumari" and is used as an ingredient of herbal formulation. Choi *et al.* (2001) isolated aloe-emodin and different form of aloins (aloin A and B) from freeze dried aloe vera leaves. They significantly decrease in blood glucose levels along with protective effect on insulin producing β cells. Aloe vera contains 75 potentially (Amar *et al.,* 2008). Chemical analysis has revealed that this clear gel contains amino acids, minerals, vitamins, enzymes, proteins, polysaccharides and biological stimulators. Feed contribute 60-65% in the cost of poultry production. There is an immense demand to reduce feeding cost and to efficiently utilize nutrients for higher economic return. Natural products are safe for broilers with no residual effect. Generally, medicinal plants improve apparent whole tract and ideal digestibility of the nutrients. Aloe vera (*Aloe barbedensis*) gel has been reported to possess anti-inflammatory activities (Davis *et al.,* 1994). Aloe vera, a medicinal plant, could be an effective substitute for its chemical nature and antimicrobial activities. Aloe gel has been used as antibiotics (Swaim *et al*., 1992), wound healing (Davis *et al*., 1994), anti-inflammatory anti coccidial (Mwale *et al*., 2005) and anti-ulcer (Koo, 1994) agent. Several studies have shown antimicrobial properties of herb extract which can improve intestinal micro flora population an enhance health of broilers digestive system through reduction in number of diseases making bacteria. However, there is a limited research works have been conducted on the effect of aloe vera aqueous extract on production performance of broiler. Therefore the study was been under taken to determine the influence of aloe gel on growth performance of broilers and evaluating the cost and return analysis after using the different level of aloe gel in broiler production.

2. Materials and Methods

2.1. Study area

The farm was recognized as small scale broiler farm, keeping 500- 1000 broilers per batch situated in Dinajpur District of Bangladesh. The experiment was conducted from mid April to mid May of 2013 at experimental farm named Rahman Poultry Farms in Dinajpur. During the experiment, the average daily mean temperature was 27°C (mean of highest temperatures 32°C and of the minimum 22°C) and average relative humidity was 60%.

2.2. Dietary treatments and management

The experiment has been approved by Department of Animal Science and Nutrition, Hajee Mohammad Danesh Science and Technology University. One hundred and twenty day old Ross 308 chicks of approximately same body weight were purchased from renounced poultry chicks suppliers. The chicks were divided into five treatment groups with three replicates (twenty four chicks for each treatment) on a completely randomized design. The control group (To) was provided with plain water along with required diet. For the next four treatment groups (T_1, T_2, T_3 and T_4) were provided with 5, 10, 15 and 20 ml per liter of aloe vera gel respectively. Experimental diets were fed from 11 days to 35 days of age. Nutritional requirement of birds in different experimental periods were extracted from Table 1 provided for farming Ross 308 chicks. Broilers were fed *ad libitum* throughout the experimental period.

2.3. Housing

The house of indoor system was made with a concrete floor and windows were being built with upper fans for ventilation. Ventilation system was limited by flat roofing which made the inside air movement contained within the house as there was no air space on the top. Fresh and dried rice husk was used as litter of about 5 cm depth.

2.4. Lighting

During this study, the birds received a lighting regimen of 23 h light: 1 h darkness. Thermostatically electric brooders were used to provide additional heat during brooding. Brooding temperature was initially set to 33±1°C and was gradually reduced over 3 wks to acclaim chicks to outdoor temperatures.

2.5. Feeding

Feed and water were provided *ad libitum.* Starter diets were provided from day 1 day to 16 days of age and finisher diets from day 17 to 35 days of age. For the rest of the feeding period, feeds were placed on the feeding trough. *Ad libitum* water was supplied available at all times in water trough.

2.6. Preparation of 10% aloe gel infusion

Aloe vera plants (Figure 1) were purchased from local horticulture centre and nurtured them in front of the open land of research poultry farm. Aloe gel infusion was prepared accordingly to the method of Durrani *et al.* (2008). Fresh aloe leaves were collected from garden for the extraction of gel. The aloe gel was extracted from the leaf manually by making a cut, using a pocket knife. Latex of the leaf was removed and gel was collected in a beaker. A 10% (w/v) concentrated infusion was prepared by taking 100 g of fresh gel in a glass bottle and one liter of boiled water at room temperature was poured on it. The bottle was shacked for 5-7 minutes to ensure thorough mixing and was then kept for 6-8 hours at room temperature prior to use. The P^H of aloe vera gel was 4.49. It was a colorless gel with negative microbial load.

2.7. Data collection

Records were collected from 11 days to 35 days in mid April to mid May in 2013. Birds of each treatment was randomly selected and weighed on a schedule basis for live weight gains. Electronic weighing scale was used for sample group weighing to determine the live weights. Feed intake was estimated by calculating the required amounts offered in gm and refused amounts on the schedule basis according to the manual of nutrient requirement for poultry Bureau of Indian Standard (B. I. S., 1992). Feed intake, live weight gains, mortality and feed efficiency were taken from 11 days to 35 days of age in each treatment group of broilers. Daily and cumulative feed intake was determined by offering known amount of feed and measuring refusal feed (Feed intake = Feed offered – Feed refused). Similarly, feed efficiency was measured by the following formula. (Feed Efficiency = Total feed intake ÷ Total weight gain).Chicks' weight and feed consumption were recorded for each experimental unit as schedule time intervals. After 35 days, two birds from each replicate was selected, slaughtered (12 h after feed withdraw). After sacrificing, carcasses were immerged into hot water (56°C for 120 s) and then plucked and manually eviscerated to obtain the ready to cook carcass. The carcass, stomach, abdominal fat, breast meat and leg meat were weighed. Percent of eviscerated carcass was calculated as the ratio between the eviscerated carcass and live weight after fasting broilers and feed were weighed at 11, 22 and 35 days of age for determination of live weight and feed efficiency. Livability was recorded as a percentage of live birds.

2.8. Statistical analysis

The data were statistically analyzed By MSTAT-C software with the standard procedures of analysis of variance (ANOVA), using completely randomized design. Means were compared for significance of differences by DMRT suggested by Steel and Torrie (1981).

3. Results and Discussion

3.1. Body weight gain

The live weight of broilers fed on 15 ml/L aloe vera aqueous extract in drinking water showed significantly higher live weight gain ($P<0.05$) than those of the broilers provided the clean water (Table 2). The broilers of T_3 gained 1410 g whereas the treatment groups of T_1, T_2, T_4 gained 1258 g, 1345 g, 1396 g respectively. The live weight was increasing up to 15 ml/L of aloe gel and then decreased slightly provided with 20 ml/L of aloe vera aqueous extract in drinking water. Changkang *et al.* (2007) found that 600 mg of aloe *vera* gel water extract results in significant increased live weight gain in third and sixth weeks. The birds of T_3 group provided 15 ml/L aloe vera extract, revealed higher ($P<0.05$) live weight gain as compared to other groups. Similar findings have been reported by Jiang *et al*. (2005), Guo *et al.* (2004) and Durrani *et al*. (2008).

Swaim *et al.* (1992) found that broilers took 10 ml aqueous extract of aloe vera per liter of drinking water showed better performance due to diversified antimicrobial activities of aloe gel. Broilers are prone to various environmental stresses that negatively affect bird's immunity and minimize their resistance to different diseases probably due to oxidative damage of lymphoid tissues that result in impaired antibodies production. The antioxidant nature of medicinal plants (Botsoglou *et al*., 2001) can alleviate the negative influence of environmental stresses and can improve immune function to combat different types of diseases resulting increased growth performance. Figure 2 showed the effect of aloe vera extract in drinking water on live weight.

In this line diagram, Y axis showed the live weight in grams and X axis showed the experimental period on day 11, day 22 and day 35 respectively.

Table 1. Ingredients and chemical composition of the basal diets[1].

Ingredients (%)	**Starter (0-16 d)**	**Grower (17-35 d)**
Corn	54.87	61.78
Soybean meal	36.72	26.36
Fish meal	1.31	4.50
Vegtable oil	3.00	4.00
Limestone	1.15	1.05
Dicalcium phosphate	1.94	1.49
Vit. and min. premix1	0.50	0.50
Salt	0.30	0.30
DL-methionine	0.21	0.02
Total	100.00	100.00
Calculated Chemical Composition		
ME (kcal/kg)	2900	3100
CP (%)	21.44	19.37
Calcium (%)	1.05	1.00
Phosphorus (%)	0.16	0.50
Sodium (%)	1.41	0.14
Arginine (%)	1.41	1.23
Methionine + Cystine (%)	0.91	0.69
Lysine (%)	1.20	1.10
Tryptophan (%)	0.31	0.26

[1]provide per kilogram of diet: vitamin A, 15000 IU; vitamin D_3, 8000 IU; vitamin K_3, 3 mg; B_{12}, 15 µg; niacin, 32 mg; choline, 840 mg; biotin, 40 µg; thiamine, 4 mg; B_2 (riboflavin), 6.6 mg; pyridoxine, 5 mg; folic Acid, 1 mg; Zn, 80 mg; Mn, 100 mg; Se, 200 mg; Fe, 80 mg; Mg (magnesium oxide), 12; Cu, 10 mg; Ca (calcium pontatenate), 15 mg; iodeine,1 mg.

Table 2. Mean body weight gain, feed and water intake, feed efficiency, feed cost and gross return from broilers given aloe extract in drinking water.

Parameters	**T_0 0 ml/L**	**T_1 5 ml/L**	**T_2 10 ml/L**	**T_3 15 ml/L**	**T_4 20 ml/L**	**Level of Sign.**
Initial Live wt. (g)	336±13	338±16	335±18	337±14	334±15	-
Final live wt. (g)	1496^{a}±28	1589^{b} ±31	1674^{c}±26	1747^{d}±38	1725^{cd}±22	*
Live wt. gain(g)	1160^{a}±14	1258^{b}±16	1345^{c}±17	1410^{d}±23	1396^{cd}±21	*
Feed intake g/25 d	2297±42	2305±54	2314±62	2315±36	2321±58	NS
Water intake ml/25 d	5623±32	5646±34	5655±37	5658±33	5656±35	NS
Feed efficiency	1.98^{a}±0.03	1.83^{b}±0.07	1.72^{c}±0.05	1.64^{d}±0.07	1.66^{d}±0.08	*
Feed cost (Tk./chick)	123±8	125±5	128±7	127±11	126±9	NS
Gross return (Tk./chick)	52±2	53±4	54±7	54±5	53±3	NS
Dressing %	69	71	72	74	71	NS
Abdominal fat (g)	24	26	25	27	27	NS

NS Means in row with different superscripts were significantly different at P<0.05, S= statistically not significant, *= statistically significant

3.2. Feed intake

The total feed intake of experimental period of the broilers in all treatment groups were not significantly differs from one another. However, the broilers of T_3 group took containing 15 ml/L aloe vera gel water showed higher feed intake, due to the phytogenic substance in aloe vera that may stimulate appetite and endogenous secretion which in turn improved performance (Windisch *et al.*, 2008). Olupona *et al.* (2010) reported that the feed intake was higher in the broilers took aloe gel treated drinking water. Total feed intake was gradually increased with increased level of aloe gel in drinking water. Figure 4 showed the average feed intake in grams along with different treatment groups. In this diagram T_3 showed higher feed intake among all treatment groups. The total

feed consumption of each treatment group was gradually increased up to 15 ml/L of aloe vera mixed drinking water and then become went down slightly.

Figure 1. Aloe vera leaves.

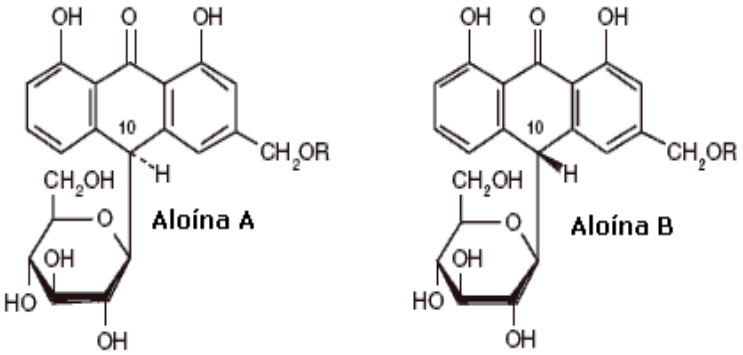

Figure 2. Chemical structure of aloein.

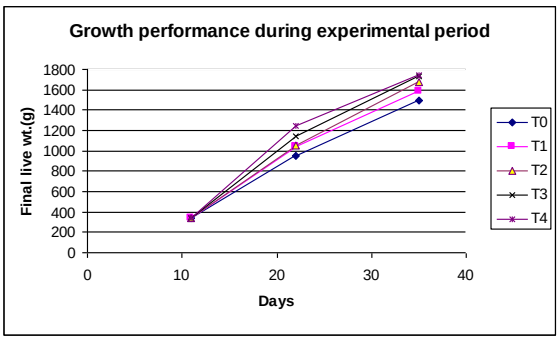

Figure 3. Effect of aloe vera extract in drinking water on growth performance.

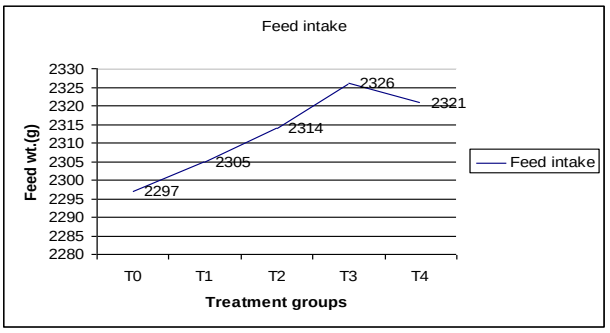

Figure 4. Effect of aloe vera extract in drinking water on feed intake.

3.3. Water intake

No significant difference in mean water intake was found among all treatment groups. Odo *et al.* (2010) reported no significant difference (P> 0.05) on water intake. Water intake was recorded at the end of experiment.

3.4. Feed efficiency

At the experimental period, the broilers of T_3 groups took containing15 ml/L aloe gel converted feed to meat most efficiently. The feed efficiency of T_0 was significantly (P<0.05) lower than the treatment groups (Table 2). The feed efficiency of the broilers took 15 ml/L and 20 ml/L aloe vera aqueous extract in drinking water were significantly (P<0.05) higher than the broilers took 5 ml/L and 10 ml/L aloe vera aqueous extract in drinking water . The feed efficiency were increased with increasing level of aloe vera aqueous extract in drinking water up to 15 ml/L, but 20 ml/L aloe gel showed slightly decreased feed efficiency. Mehala and Moorthy (2008) found that no significant difference among the treatment groups due to dietary inclusion of aloe vera and cucumber longa and its combination on feed efficiency. Guo *et al.* (2004) found higher feed efficiency in broilers treated with Chinese herbs on the days 21 through 28. A poorer feed efficiency may be obtained possibly attribute to poorer utilization of ingested energy.

3.5. Abdominal fat and dressing percentage

Mean abdominal fat and dressing percentage was measured on 35 days by digital weight balance. Results on dressing percentage on day 35 were not significant, the relatively the heavier dressing percentage was observed in T_3 (74%) than other treatments T_0 (69%), T_1 (71%), T_2 (72%) and T_4 (71%) respectively. Abdominal fat deposition were T_0 (24 g), T_1 (26 g), T_2 (25 g), T_3 (27 g) and T_4 (27 g) respectively. This finding favorably compared with earlier reports of Sinurat *et al.* (2002) who stated that supplementation of fresh aloe vera gel (0.25 g/kg) and dry aloe vera gel (1.0 g/kg) in broiler diet from 1 day old to 5 weeks of age showed no significant effect on abdominal fat levels.

3.6. Feed cost and gross return

Mean feed cost and gross return per broiler was not affected by giving aloe extract to broilers in drinking water. Among the treatment groups mean feed cost were T_0 (Tk.123), T_1 (Tk.125), T_2 (Tk.128), T_3 (Tk.127) and T_4 (Tk.126) respectively. Although, not significant, the relatively higher gross return per broiler in T_2 and T_3 (Tk.54), than in other treatment group T_0 (Tk.52), T_1 (Tk.53), T_4 (Tk.53) respectively .This result revealed the importance of aloe extract given to broilers in drinking water.

3.7. Conclusions

The study was conducted to make an inventory on using aloe vera aqueous extract (w/v) in drinking water on growth performance of broiler. The experiment was conducted at the local commercial small scale broiler farmer in Dinajpur District during a period from mid April to mid May 2013. The study was conducted with 120 Ross 308 commercial broiler chicken. The experiment was aimed at determining the influence of aloe vera gel on growth performance of broilers such related with body weight gain, feed efficiency, feed intake, and water intake. Providing 0%, 0.5%, 1.0%, 1.5% and 2.0% of aloe vera gel in drinking water had no significant ($P>0.05$) effect on feed intake, water intake. Similarly, it had no significant ($P>0.05$) effect on abdominal fat, breast, thigh and offal weight, feed cost and gross return. But, live weight gain and feed efficiency were significantly ($P<0.05$) better than control group. In case of live weight gain and feed efficiency, 1.5% inclusion level of aloe vera gel is more appreciated for satisfactory performance whereas other inclusion level earned poor score. Moreover, there is no adverse effect on broiler production performance due to the intake of aloe vera extract in drinking water. So, the aloe vera aqueous extract 10% (w/v) up to 1.5% may be efficiently utilized in drinking water for broilers during 25 days long from 11 days to 35 days.

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Conflict of interest

None to declare.

Reference

Ajakaiye JJ, MC Mazorra and JRG Diaz, 2011. Vitamin C and E can alleviate adverse effects of heat stress on live weight and some egg quality profiles of layer hens. Pak. Vet. J., 31: 45- 49.

Amar S, R Vasani, DG Saple, 2008. Aloe vera: A short review. Indian J. Dermatol., 53:163- 166.

B I S, 1992. Nutrient requirement for poultry. Bureau of Indian Standard, I.S. 13574.

Botsoglou NA, DJ Fletouris, 2001. Drug Residues in Foods: Pharmacology, Food Safety and Analysis. Marcel Dekker, Inc. Publ., New York, USA.

Changkang W, J Hongqiang, T Jianming, T Weiwei, SA Renna, Z Qi, 2007. Effect of aloe powder and extract on production performance and immune function of broiler chickens. Journal of Fujian Agricultural Forestry University, 36:614-617.

Choi SW, BW Son, YS Son, 2001. The wound healing effect of a glycoprotein fraction isolated from aloe vera. British J. Dermatol., 145: 535-545.

Davis RH, JJ Donato, GM Hartman and RC Haas, 1994. Anti-inflammatory and wound healing activity of a growth substance in Aloe vera. J. Am. Podiat. Med. Assoc., 84: 77-81.

Durrani FR, N Sanaullah, Z Chand and S Akhtar, 2008. Using of aqueous extract of aloe gel as anticoccidial and immune stimulant agent in broiler production. Sarhad J. Agric., 24: 666-670.

Guo FC, RP Kwakkel, J Soede, BA Williams, MWA Verstegen, 2004. Effect of a Chinese herb medicine formulation, as an alternative for antibiotics, on performance of broilers. Br. Poult. Sci., 45:793-797.

Mehala C, and M Moorthy, 2008. Effect of Aloe vera and cucumber longa (Turmeric) on carcass characteristics and biochemical parameters of broilers. Int. J. Poult. Sci., 7:857-861.

Mwale M, E Bhebhe, M Chimonyo and TE Halimani, 2005. Use of herbal plants in poultry health management in the Mushagashe small-scale commercial farming area in Zimbabwe. Int. J. Appl. Res. Vet. M., 3: 163-170.

Odo BI, BU Ekenyem, AC Nwamo, 2010. Effects of aloe vera as leaf protein concentrate on growth performance of cockerels. Int. J. Poult. Sci., 9: 426-428.

Olupona JA, OR Omotoso, AA Adeyeye, OD Kolawole, AP Airemionkhale, and OO Adejinmi, 2010. Effect of aloe vera juice application through drinking water on performance, carcass characteristics, hematology and organoleptics properties in broilers. pp 42-43 in Proc. 98th Annual Meet. Poultry Science Association, Raleigh, NC, USA.

Roenick WP, 1998. Poultry will overtake pig meat consumption. Worlds Poult. Sci. J., 12: 14-16.

Sinurat AP, T Purwadaria MH Togatorop, T Pasaribu, IAK Bintang, S Sitompul and J Rosida, 2002. Responses of broilers to aloe vera bioactives as feed additive: the effect of different forms and levels of bioactives on performances of broilers. J. Ilmu Ternak dan Vet., 7: 69-75.

Swaim SF, KP Riddell and JA McGuire, 1992. Effects of tropical medications on the healing of open pad wounds in dogs. J. Am. Anim. Hosp. Assoc., 28: 499-502.

Volger BK, and E Ernst, 1999. Aloe vera: A systematic Review of its clinical effectiveness. J. Genet., 49:823-828.

Windisch W, Schedle K, Plitzner C, Krois-mayr A, 2008. Use of phytogenic products as feed additives for swine and poultry. J. Anim. Sci., 86:140-148.