

Effects of *Aloe vera* on dressing percentage and haemato-biochemical parameters of broiler chickens

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Abstract

Aim: To evaluate the effects of *Aloe vera* on dressing percentage and hemato-biochemical parameters of broiler chickens.

Materials and Methods: A total of 90 chicks were used in this study. They were randomly allocated into 3 treatment groups. Fresh *Aloe vera* leaf juice (ALJ) was prepared and administered to the test group T3 at the rate of 20 g/L in drinking water daily. This study was carried out for 42 days. Dressing percentage and hemato-biochemical parameters were recorded at the end of experiment.

Results: Group that was given *Aloe vera* (T3) showed numerically higher dressing percentage as compared to control group (T1) and drug control group (T2). It also showed significantly ($P < 0.05$) higher value of Hb concentration, PCV percentage, total leukocyte count (TLC), blood plasma glucose concentration, and serum calcium level as compared to control and drug control groups. No significant ($P > 0.05$) differences were observed in other parameters among all the treatment groups.

Conclusion: *Aloe vera* has potential to be a growth promoter in broiler chicks and its growth promoting effects are comparable to that of antibiotic growth promoter (AGP).

Keywords: *Aloe vera*, broilers, dressing percentage, growth promoter, poultry

Introduction

Poultry sector is one of the fastest growing sectors in the production of food animals in India. India currently ranks fifth in broiler chicken production in the world [1]. Growth promoters are agents added to animal feeds in order to enhance the feed conversion efficiency for increased formation of muscles, fat and body growth in feed-lot animals, including poultry [2]. Antibiotic growth promoters (AGP) have been widely used in practice in the poultry and other livestock feeds for years. They have been reported to enhance the growth performance of poultry and other livestock. However, continuous and sub-therapeutic uses of AGP led to the development of undesirable antibiotic resistance in poultry [3]. Thus, many countries have banned the use of antibiotics in feed [4]. Modern medicinal system has many adverse and unwanted effects [5]. Hence, there is a need to look for an alternative to AGP that could be used for better growth performance and higher production of livestock [6]. Various commonly used AGPs are prebiotics, probiotics, synbiotics, enzymes, acidifiers and phytobiotics [7].

Phytobiotics are the components of plants or spices which have beneficial effects on the growth and production of animals. Either whole plants, parts of plants or essential oils can be used as phytobiotics. A general feature of phytobiotics is that they are a complex mixture of bioactive compounds. For example, a hawthorn fruit, a common growth promoter and digestive stimulant has been found to have more than seventy kinds of organic chemicals [8]. Phytochemicals present in phytobiotics have antimicrobial actions [9]. Their mechanism of action involves improved consumption and conversion of food, digestibility and weight gain of broiler chickens [10,11]. Herbs are the oldest friends of mankind [12]. Many of these plants are rich in proteins, vitamins, minerals, essential oils and many alkaloids [13,14]. Many of them have shown increased production performance when incorporated into broiler feed [15,16]. Some herbal plants have excellent antioxidant properties [17,18]. *Aloe vera* is one of such plants, having a great medicinal potential [19]. *Aloe vera* is a succulent, stemless herb found widely in India, China and many Egyptian countries, having more than 70 biologically active compounds [20]. Many studies have shown antibacterial, antiseptic, anti-inflammatory and immune-modulator effects of *Aloe vera* [21-23]. Many studies have also shown anti-

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oxidant and anti-cancerous properties of *Aloe vera* [24,25]. Apart from the above, anti-mutagenic effects and anti-hypersensitivity effects of *Aloe vera* have also been reported by some researchers [26,27].

However, little work has been done to study the efficacy of *Aloe vera* for improving the growth performance of broilers. Hence, the present study was undertaken to thoroughly evaluate the effects of *Aloe vera* on the dressing percentage and hemato-biochemical parameters of broiler chickens.

Materials and Methods

Approval by the animal ethics committee: The protocol and experimental design of the study were approved by the Institutional Ethics Committee, College of Veterinary Science & AH (Anjora), Chhattisgarh, India.

The present study was conducted in the Laboratory Animal House, Department of Veterinary Pharmacology and Toxicology, College of Veterinary Science and A.H., Anjora, Durg, Chhattisgarh. The experiment was conducted during the months of July and August 2012 under deep litter system provided with standard feeding, watering and under good hygienic conditions. The leaves of *Aloe vera* were procured from the botanical garden of the Department of Pharmacology and Toxicology and fresh leaf juice was prepared daily using a mixer and grinder. The leaf juice so obtained was termed as "*Aloe vera leaf juice*" (ALJ). Day old Ven cobb 400 strain broiler chicks (n=90) from the same hatch were purchased from hatchery of M/s Indian Broiler Group, Rajnandgaon, India. Chicks were randomly allocated into 3 treatment groups of 30 chicks each. Each group is divided into 3 replicates of 10 chicks each. The treatment groups were: group T₁ (Control) having a basal diet without any feed additive, group T₂ (Standard) consisting of basal diet (basal diet consist of the feed ingredients viz., yellow maize, deoiled soybean meal, rice polish, fish meal, soybean oil, dicalcium phosphate (DCP), limestone powder (LSP), L- methionine, lysine, sodabcarb, common salt and mineral mixture in a standard ratio) with BMD (Bacitracin Methylene Disalicylate) as an antibiotic @ 0.05% in feed, group T₃ comprises of *Aloe vera* leaf juice (ALJ) @ 20g/L in drinking water, daily for 42 days. Two birds from each replicate were slaughtered to calculate the dressing percentage as per standard procedure. At the end of experiment, dressing percentage was calculated using following formula and expressed in percentage.

$$\text{dressing percentage} = \frac{\text{Eviscerated weight} + \text{Giblet weight}}{\text{Live weight}} \times 100$$

Haematological parameters: Two birds from each replicate were sacrificed on 42th day of the experiment and the following parameters were studied using standard methods. Blood of broiler birds was collected from the Jugular and Wing venous puncture into sterilized heparinised vials (Heparin @10 IU/ ml of blood) for haematological studies. Parameters studied

include hemoglobin concentration, Packed Cell Volume (PCV), Mean Corpuscular Volume (MCV), Mean corpuscular haemoglobin (MCH), Mean corpuscular haemoglobin concentration (MCHC), Total Erythrocyte Count (TEC), Total Leukocyte Count (TLC) and Differential Leukocyte Count (DLC) i.e. Lymphocyte, Heterophil, Monocyte, Eosinophil and Basophil count.

Biochemical parameters: Two birds from each replicate were sacrificed on 42th day of the experiment and the following parameters were studied using standard methods. Blood serum and blood plasma were used to evaluate various biochemical parameters. Blood plasma was used for the determination of blood glucose, and blood serum was used for the rest of the parameters. Blood was collected from the jugular and wing vein into a clean test tube and serum was separated as per standard procedure. For determination of blood plasma glucose concentration, blood was collected using sodium fluoride at the rate of 1mg per ml of blood and plasma was separated immediately by centrifugation as per standard procedure. Serum was stored at -20^oC till further use. Blood plasma was used immediately for glucose estimation. Parameters that were studied include blood plasma glucose, total protein, albumin, globulin, A/G ratio, uric acid, creatinine, calcium, phosphorus, ALT, AST, ALP in a Semi-automated analyzer (R A 50, Chemistry System Bayer) using available diagnostic kits and methodology suggested by the manufacturer.

Statistical analysis: Statistical analysis was done using completely randomized design (CRD), one way classification as per the procedure given by Snedecor and Cochran [28]. Duncan's Multiple Range Test was employed for identifying the significant differences amongst the different treatments. A P-value less than 0.05 is considered to be statistically significant.

Results and Discussion

Dressing percentage: The dressing percentages of the groups T₁, T₂ and T₃ thus obtained are presented in the Table-1. The dressing percentage of the group T₃ was numerically higher as compared to groups T₁ and T₂ but no significant differences were observed amongst all the groups.

Ojewola and Ewa [29] reported no significant differences in dressing percentage amongst the birds fed with pigeon pea seed meal (PPSM), groundnut cake (GNC), cashewnut meal (CNM) and cotton seed meal (CSM).

Haematological parameters: There was a significantly (P<0.05) higher mean Hb concentration of the group T₃ as compared to groups T₁ and T₂. The group receiving ALJ (20g/L) in the drinking water daily (group T₃) had significantly higher PCV value than T₁ and T₂. Group T₃ also showed a significant increase in Total Leukocyte Count (TLC) as compared to T₁ and T₂. No significant differences were observed between

Table-1. Effects of supplementation of *Aloe vera* on the Dressing Percentage of broiler chicks

Particular	Group/Treatment			Level of significance
	Control (T1)	Standard (T2)	<i>Aloe vera</i> (T3)	
Dressing percentage	72.49 ± 1.57	71.95 ± 0.43	73.19 ± 1.36	NS

As level of significance in the value given in Table-1 is non significant mean all the superscripts were not different, they were same, so there is no need to give different superscript. Values show Mean ± SE where n=6, NS- Not Significant

Table-2. Effects of supplementation of *Aloe vera* on Haematological parameters of broiler chicks

Parameters	Group/Treatment			Level of significance
	Control (T1)	Standard (T2)	<i>Aloe vera</i> (T3)	
Hb (g/dl)	10.43 ± 0.18 ^b	10.71 ± 0.24 ^b	11.63 ± 0.20 ^a	*
PCV (%)	27.00 ± 1.29 ^b	27.67 ± 1.33 ^b	31.00 ± 0.97 ^a	*
MCV (fl)	109.43 ± 5.31	107.08 ± 8.95	112.59 ± 4.80	NS
MCH (pg)	42.52 ± 2.16	41.25 ± 2.47	42.28 ± 1.62	NS
MCHC (g/dl)	38.98 ± 1.65	39.06 ± 1.51	37.66 ± 1.19	NS
TEC (million/mm ³)	2.49 ± 0.16	2.63 ± 0.12	2.77 ± 0.10	NS
TLC (thousand/mm ³)	23.00 ± 0.37 ^b	21.67 ± 0.49 ^b	25.50 ± 1.20 ^a	*
Lymphocyte (%)	68.50 ± 1.31	67.50 ± 1.48	68.33 ± 1.09	NS
Heterophil (%)	28.83 ± 1.22	30.17 ± 1.38	28.50 ± 0.76	NS
Monocyte (%)	1.67 ± 0.33	1.50 ± 0.43	2.00 ± 0.37	NS
Eosinophil (%)	0.67 ± 0.33	0.50 ± 0.34	0.66 ± 0.42	NS
Basophil (%)	0.33 ± 0.21	0.33 ± 0.21	0.50 ± 0.22	NS

Values show Mean ± SE where n=6, NS- Not Significant, Means having different superscripts in rows differ significantly, * P < 0.05

the groups T1 and T2. There were no significant differences in the values of MCV, MCH, MCHC, TEC and DLC (Lymphocyte, Heterophil, Monocyte, Eosinophil and Basophil counts) amongst all the groups. These details are shown in the Table-2.

The present findings for Hb, PCV and WBC were in agreement with the report of Mmereole [30] reported that data in broiler chickens, who showed a significant increase in above parameters in the group having *Aloe vera* as compared to group having antibiotics. The author reported no significant difference with the control group. Fadlalla et al. [31] reported a significantly higher WBC count in the birds fed with 0.3% garlic in feed.

Biochemical parameters: There was significantly higher mean blood plasma glucose in the group T3 as compared to T1 and T2. The group T3 also showed a significant rise in the level of calcium as compared to T1 and T2. No significant (P<0.05) differences were observed in the level of Calcium between the groups T1 and T2. The present study showed no significant differences in the levels of total protein, albumin, globulin, A/G ratio, uric acid, creatinine, phosphorus, ALT, AST and ALP amongst all the groups. These details are shown in the Table-3.

Ojewola and Ewa [32] showed a significantly (P<0.05) higher calcium and phosphorus levels in the birds fed with Pigeon pea seed meal (PPSM) as

Table-3. Effects of supplementation of *Aloe vera* on Biochemical Parameters of broiler chicks

Parameters	Group/Treatment			Level of significance
	Control (T1)	Standard (T2)	<i>Aloe vera</i> (T3)	
Glucose (mg/dl)	130.85 ± 3.36 ^b	136.00 ± 2.95 ^b	144.42 ± 2.81 ^a	*
Total Protein (g/dl)	3.88 ± 0.08	3.90 ± 0.13	4.02 ± 0.11	NS
Albumin (g/dl)	1.82 ± 0.05	1.80 ± 0.08	1.90 ± 0.08	NS
Globulin (g/dl)	2.07 ± 0.06	2.10 ± 0.05	2.12 ± 0.06	NS
A/G Ratio	0.88 ± 0.03	0.86 ± 0.02	0.90 ± 0.04	NS
Uric Acid (mg/dl)	5.77 ± 0.05	5.73 ± 0.06	5.78 ± 0.08	NS
Creatinine (mg/dl)	2.45 ± 0.12	2.27 ± 0.10	2.17 ± 0.07	NS
Calcium (mg/dl)	8.25 ± 0.17 ^b	8.33 ± 0.43 ^b	9.08 ± 0.36 ^a	*
Phosphorus (mg/dl)	4.63 ± 0.21	4.67 ± 0.31	5.08 ± 0.25	NS
ALT (IU/L)	5.61 ± 0.20	5.78 ± 0.14	5.73 ± 0.22	NS
AST (IU/L)	132.83 ± 2.00	133.17 ± 3.45	135.16 ± 2.83	NS
ALP (IU/L)	186.33 ± 3.75	183.67 ± 3.69	185.83 ± 3.56	NS

Values show Mean ± SE where n=6, NS- Not Significant, Means having different superscripts in rows differ significantly, * P < 0.05

compared to that of soyabean meal (SBM) and cotton seed meal (CSM). Akbarian et al. [12] collected data in broiler chickens. showed no significant differences in the level of serum metabolites such as LDL, HDL, cholesterol and electrolytes. The author also showed no significant differences amongst the activities of AST, ALT and LDH enzymes.

The present study showed no significant differences in the values of MCV, MCH, MCHC, TEC, DLC, total protein, albumin, globulin, A/G ratio, uric acid, creatinine, phosphorus, ALT, AST and ALP amongst all the groups. This result may be attributed to the fact that there were no detrimental effects due to *Aloe vera* and standard antibiotics in diet.

Conclusion

Aloe vera alone has significant potential as a growth promoter in broiler chicks. The growth promoting effects of *Aloe vera* alone are comparable to that of AGP. *Aloe vera* has potential to positively influence the dressing percentage as its administration resulted in a numerically higher dressing percentage than AGP. Furthermore, *Aloe vera* did not show any adverse effects on the health status of birds as evident from their haematological and biochemical studies.

Authors' contributions

JS: Concept and design of the experiment along with acquisition, analysis and interpretation of data under

the direct guidance and supervision of KMK. KC and NSP: drafted and revised the manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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