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Effect of dietary supplementation of aloe vera (*Aloe barbadensis*) and tulsi (*Ocimum sanctum*) powder on growth performance of broiler chickens

GOVINDA KUMAR[1], SANJAY KUMAR[2], KAUSHALENDRA KUMAR✉[3], PANKAJ KUMAR SINGH[4], RAJNI KUMARI[5], SAVITA KUMARI[6], ROHIT KUMAR JAISWAL[7], RAVI RANJAN KUMAR SINHA[8] and JAY PRAKASH GUPTA[9]

Bihar Animal Sciences University, Patna Bihar 800014 India

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ABSTRACT

This study aimed to evaluate the effect of dietary supplementation with *Aloe barbadensis* (aloe vera), *Ocimum sanctum* (tulsi) powder, and their combination on growth performance and nutrient utilization of broiler chickens. A 35-day feeding trial was conducted using iso-nutritive diets formulated to compare their individual and combined effects. Two-hundred-day-old Cobb 400Y broiler chicks were procured, and randomly distributed into four treatment groups of 50 birds each, with five replicates of 10 birds per group. Four dietary treatments, including a control diet (T0 – basal diet), aloe vera (T1 - basal diet + 1.5%), tulsi (T2 - basal diet + 1%), and both in combination (T3 - basal diet + 1.5% aloe vera + 1% tulsi). The results indicated distinct performance trends among treatments. Birds receiving combined supplementation of aloe vera and tulsi exhibited most consistent improvement in feed intake, body weight gain, feed conversion ratio, and overall performance index as compared to the control and single-supplement diets. Enhanced nutrient retention was also observed, particularly for dry matter, crude protein, and ether extract, suggesting improved digestibility and utilization efficiency. However, calcium and phosphorus retention showed minimal variation across treatments, indicating that mineral absorption was not markedly influenced by supplementation. Overall, the combined use of aloe vera and tulsi demonstrated synergistic benefits, promoting better growth performance and nutrient utilization in broilers. These findings highlighted the potential of herbal feed additives as sustainable, natural alternatives to synthetic growth promoters, highlighting its potential as a natural growth promoter in broiler production.

Keywords: *Aloe barbadensis*, Broiler, Growth performance, *Ocimum sanctum*

Feed represents the largest operating expense in poultry production, typically accounting for 60–75% of the total production cost, thereby making feed efficiency a critical determinant of farm profitability (Ravindran, 2013). In response to growing concerns regarding antimicrobial resistance and consumer demand for residue-free animal products, phytogenic feed additives, plant-derived bioactive compounds such as herbs, spices, essential oils, and oleoresins are increasingly being incorporated into poultry diets as natural alternatives to antibiotic growth promoters. It acquires antimicrobial, antioxidant, anti-inflammatory, and immunomodulatory properties that can improve nutrient utilization, feed conversion efficiency, growth performance, gut health, and immune function. Consequently, their use supports sustainable and environmentally responsible poultry production while enhancing the quality and safety of poultry products for consumers (Aminullah *et al.* 2025).

Aloe vera (*Aloe barbadensis*), commonly known as Ghritkumari, is a succulent plant of Liliaceae family, and is widely recognized for its rich composition of bioactive compounds such as flavonoids, saponins, tannins, anthraquinones, and polysaccharides. It has been often referred to as the "secret plant," and valued since ancient times for its diverse therapeutic benefits. Aloe vera is extensively used in herbal medicine, cosmetics, and nutraceuticals due to its antibacterial, antifungal, antioxidant, anti-inflammatory, immunomodulatory, and wound-healing properties (Moorthy *et al.* 2009; Boudreau and Beland, 2006). Tulsi (*Ocimum sanctum*), belonging to Lamiaceae family, holds great cultural and medicinal significance in India and is revered as the "Queen of Herbs." Known in Sanskrit as "the incomparable one," it

Present address: [1]M.V.Sc. Scholar. [2]Professor. [3]Associate Professor, Department of Animal Nutrition, BVC, BASU, Patna. [4]DRI-cum-Dean PGS (vetpank@gmail.com), BASU, Patna. [5]Senior Scientist (drrajnikumari@rediffmail.com) DLFM, ICAR-RCER, Patna. [6]Associate Professor (drsavitakumari@gmail.com), Department of Veterinary Microbiology, BVC, BASU Patna. [7]Assistant Professor (rohitkmrjswl76@gmail.com), Department of LPT, BVC, BASU Patna. [8]Associate Professor, Department of LPM, BVC, BASU, Patna. [9]Associate Professor, Department of AGB, BVC, BASU, Patna. ✉Corresponding author email: drkaushalbvc@gmail.com

is a cornerstone of Ayurvedic medicine. Tulsi possesses antimicrobial, antistress, anti-inflammatory, antipyretic, immunomodulatory, hypoglycemic, and analgesic effects, primarily attributed to its active constituents like eugenol, beta-sitosterol, ascorbic acid, and beta-carotene (Singh *et al.* 2010, Choudhury *et al. 2025*). In poultry nutrition, both aloe vera and tulsi are used as natural growth promoters, enhancing gut health, immunity, stress resilience, and overall performance (Sheoran *et al.* 2017).

Given their complementary bioactive properties, a comparative study was designed to evaluate the effects of dietary supplementation of aloe vera and tulsi powders, both individually and in combination, on key performance parameters in broilers. The trial specifically assessed feed intake, body weight gain, FCR, and performance index, aiming to explore herbal alternatives for enhancing broiler productivity.

MATERIALS AND METHODS

Feeding, management and dietary treatment: A controlled experiment was carried out to assess the impact of dietary supplementation with *Aloe barbadensis* and *Ocimum sanctum* leaf powders on the growth performance of broiler chickens. The study protocol was duly approved by the Institutional Animal Ethics Committee (IAEC), Bihar Veterinary College, Patna, and the trial was conducted at the Poultry Research and Training Centre, Bihar Animal Sciences University, Patna. A total of 200 day-old broiler chicks were procured locally and individually weighed before allocation. The chicks were randomly divided into four treatment groups (T0, T1, T2, and T3), each with five replicates of 10 chicks, ensuring nearly uniform initial body weights across groups. Experimental diets were prepared using feed ingredients and additives sourced from the local market in Patna. In the trial, the chicks were allotted to four dietary treatment groups. The control group (T0) received only the basal ration, while the other groups were supplemented with herbal additives. The T1, T2, T3 groups were provided with the basal ration fortified with 1.5% aloe vera powder, 1% tulsi powder, and a combination of 1.5% aloe vera powder and 1% tulsi powder, respectively. A standard basal ration was formulated for three growth phases: pre-starter (0–7 days), starter (8–21 days), and finisher (22–35 days), following the Bureau of Indian Standards (BIS, 2007) guidelines (Table 1). Proximate composition of feed ingredients was analyzed using AOAC (2005) methods, while calcium content was determined by the procedure of Talapatra *et al.* (1940). Diets were balanced for metabolizable energy, lysine, and methionine to meet the nutritional requirements of broiler chickens. During the 35-day feeding trial, all chicks were housed under a deep litter system with free access to feed and water. Standard management practices, including sanitation, ventilation, and vaccination, were uniformly applied across all groups.

Performance parameters and nutrient retention: During the experimental period, several growth performance parameters were systematically recorded and analyzed. Feed intake for each treatment group was measured on a weekly basis by calculating the difference between the total feed offered and the residual feed left at the end of the week. The body weight of individual birds was recorded at the start of the trial and thereafter at weekly intervals until the completion of the 35-day study to track growth trends. The feed conversion ratio (FCR), a key indicator of feed efficiency, was determined using the standard formula, i.e., the ratio of total feed consumed to the corresponding

Table 1. Ingredient and chemical composition (% DM basis) of basal experimental diets of broiler chickens

Ingredients	Pre-starter (0-7 days)	Starter (8-21 days)	Finisher (22-35 days)
Maize	57.90	56.00	59.20
Soyabean meal	26.50	29.00	25.50
Groundnut cake	6.00	4.00	3.00
Meat cum bone meal	5.00	4.00	3.70
Vegetable oil	1.82	3.89	5.32
Limestone powder	0.80	0.90	0.90
Dicalcium phosphate	0.70	0.85	1.00
Common salt	0.30	0.30	0.30
Trace mineral premix[1]	0.15	0.15	0.15
Vitamin Premix[2]	0.10	0.10	0.10
L-lysine	0.25	0.15	0.050
DL-Methionine	0.12	0.10	0.130
Choline chloride	0.06	0.06	0.150
Toxin binder	0.10	0.10	0.10
Coccidiostat	0.05	0.05	0.05
Sodium bicarbonate	0.150	0.150	0.150
Total	100	100	100
Chemical composition (% DM basis)			
Crude protein (%)	23.09	22.13	20.21
Ether extract (%)	8.11	8.23	8.23
Crude fibre (%)	3.81	3.90	3.90
Total ash (%)	6.26	6.34	6.34
Calcium (%)	1.00	1.00	1.00
Total phosphorus (%)	0.71	0.73	0.73
Available phosphorus (%)	0.41	0.44	0.44
ME (kcal/kg) *	3012.96	3125.36	3219.87
Lysine (%) *	1.01	1.00	1.00
Methionine (%) *	0.45	0.44	0.44

*Calculated values

[1]Trace mineral premix supplied (per kg diets): Magnesium-300mg, Manganese-55mg, Iodine-0.4 mg, Iron-56 mg; Zinc-30mg and Copper-4mg.

[2]Vitamin premix supplied (per kg diet): vitamin A-8250IU, vitamin D3-1200ICU; vitamin k-1 mg; vitamin B1-2 mg, vitamin B2-4 mg; niacin-60 mg, pantothenic acid- 10 mg, cyanocobalamin-10 and choline=500mg.

body weight gain. Furthermore, the performance index of broilers across different growth phases was calculated by dividing the body weight gain by the respective FCR values.

At the conclusion of the fifth week of the feeding trial, a five-day metabolism study was carried out to assess the apparent total tract nutrient retention in broiler chickens. For this purpose, eight birds representing the average body weight of each treatment group were randomly selected and transferred to individual metabolic cages. Birds were provided with their respective experimental diets along with *ad libitum* access to fresh drinking water. A two-day adaptation period preceded the actual trial, followed by a five-day faecal collection phase.

During the collection phase, a weighed quantity of feed was offered to each bird daily at 9:00 a.m. and the leftover feed was collected and weighed the following morning to accurately determine feed intake. For excreta collection, faecal trays lined with polythene sheets were placed under each cage. Excreta were collected daily, pooled, and subsequently dried in a hot air oven at 70°C for 48 h to estimate dry matter content. The dried samples were then preserved for further analysis. Representative samples of both the experimental diets and faeces were subjected to proximate analysis to determine nutrient composition. Phosphorus content was estimated following the AOAC (2005) method, while calcium content was analyzed as per the procedure described by Talapatra *et al.* (1940).

Statistical analysis: All collected data were analyzed statistically using the Statistical Package for the Social Sciences (SPSS), version 20.0. Differences among treatment groups were evaluated through one-way analysis of variance (ANOVA). Post hoc comparisons were performed using Duncan's Multiple Range Test, while mean separation was carried out using the Least Significant Difference (LSD) method. The level of statistical significance between the control and treatment groups was determined following the procedures outlined by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

In this study, different parameters like feed intake, body weight, weekly body weight gain, feed conversion ratio, performance index and nutrient retention were observed.

Feed intake: The total feed intake of broilers subjected to different dietary treatments was evaluated over a five-week period (Table 2). Statistical analysis indicated that supplementation with aloe vera (*Aloe barbadensis*) and tulsi (*Ocimum sanctum*), either individually or in combination, did not result in significant differences in overall cumulative feed intake among the treatment groups. However, during the fourth week, birds receiving herbal supplementation showed a significant ($P<0.05$) improvement in feed consumption as compared to the control group. This temporary increase in intake could be attributed to the palatability-enhancing effects of the herbal additives and the use of isocaloric and iso-nitrogenous diets, which maintained uniform nutrient composition across treatments. Interestingly, feed intake in the tulsi-supplemented group (T2) during the fourth week was statistically comparable with all other groups, suggesting consistent feeding response among the supplemented treatments.

The present findings corroborated earlier reports by Mehala and Moorthy (2008) and Hassanbeigy-Lakeh *et al.*

Table 2. Effect of dietary supplementation of aloe vera and tulsi powder on an average weekly feed intake and body weight in broiler chickens

Weeks	Treatments					
	T0	T1	T2	T3	SEM	Level of significance
			Feed Intake (g/bird)			
I	144.20±2.36	121.01±3.02	127.50±1.56	132.63±4.71	3.26	NS
II	423.98±9.21	389.21±11.50	411.01±6.23	421.25±5.51	13.01	NS
III	637.41±11.96	558.18±14.12	609.11±4.61	600.73±11.11	15.73	NS
IV	800.03^{b}±19.66	809.35^{b}±17.44	852.01^{a}±4.10	821.16^{c}±33.01	20.26	*
V	1121.19±35.14	1012.46±16.32	1098.22±32.02	1010.37±26.50	39.52	NS
I to V	3178.79±18.10	2890.21±24.66	3045.87±37.22	2986.14±26.50	40.16	NS
			Body weight (g/bird)			
0-day	44.10±0.20	45.20±0.80	43.05±0.60	45.16±0.80	1.21	NS
I	163.42^{c}±2.15	178.19^{a}±2.11	166.35^{b}±2.82	167.47^{b}±1.92	5.67	*
II	443.20^{a}±6.40	450.35^{b}±4.09	454.22^{b}±8.13	449.56^{c}±5.10	9.47	*
III	819.92±8.33	845.06±11.81	855.10±12.29	856.02±13.16	21.80	NS
IV	1292.89^{b}±19.63	1317.58^{a}±23.44	1323.46^{b}±21.16	1376.40^{c}±24.01	25.98	**
V	1733.52^{a}±31.94	1820.32^{a}±29.10	1831.16^{b}±30.63	1848.30^{c}±28.01	32.56	**

^{a,b,c} values with different superscripts in a row differ significantly, * = Significant ($P<0.05$), ** = Highly Significant ($P<0.01$), NS= Non-significant

(2012), who observed no significant influence of aloe vera supplementation, either as powder or gel, on broiler feed intake. Conversely, Appusamy (2012) reported a notable increase in intake with aloe vera crude extract, while Darabighane *et al.* (2012) also found higher consumption in aloe vera gel-fed birds. Similarly, Vasanthkumar *et al.* (2013) and Hasan *et al.* (2016) recorded improved feed intake in broilers receiving tulsi-based diets. Ashar *et al.* (2022) reported no significant effect of aloe vera powder on feed intake in broiler. The present results indicate that although aloe vera and tulsi supplementation did not significantly alter total feed intake, the transient improvement during the fourth week aligned with previous observations on phytogenic feed additives enhancing palatability and short-term consumption.

Average body weight: The average body weight of broiler chickens from different treatment groups, recorded at weekly intervals, is presented in Table 2. Body weight and weight gain are key indicators of growth performance, health, and productivity in broiler chicks. Initial body weights were comparable across groups (T0 - T3), ensuring uniform baselines. At the end of fifth week, highest final body weight was observed in the combined supplementation group (T3), followed by T2, T1, and the control (T0). Statistical analysis showed a highly significant effect ($P<0.01$) of herbal supplementation on body weight during weeks I, II, IV, and V. Week-wise observations indicated that T1 initially led in weight gain, while T2 surpassed others in week II. By week III, T1, T2, and T3 had similar weights, all exceeding the control. T3 achieved the highest body weight in week IV and maintained the lead through week V. These results demonstrated that combined aloe vera and tulsi supplementation synergistically enhances growth performance in broilers.

The present findings were consistent with previous studies demonstrating the growth-promoting effects of herbal supplements in broilers. Durrani *et al.* (2008) reported significantly higher body weight gains in birds fed aloe vera, while Alemi *et al.* (2012) observed improved performance with 0.75 - 1% aloe vera gel powder. Similarly, Appusamy (2012) recorded greater final weights in aloe vera-supplemented groups, though Mehala and Moorthy (2008) noted no significant effect at lower inclusion levels. Positive impacts of Tulsi supplementation have also been reported by Lanjewar *et al.* (2008), Swathi *et al.* (2012), and Hasan *et al.* (2016), highlighting improved body weight and growth. Tanwar *et al.* (2022) reported that combining aloe vera and tulsi as polyherbal feed additives improved overall broiler performance. Collectively, these studies support the present results, indicating that dietary

Table 3. Effect of dietary supplementation of aloe vera and tulsi powder on an average weekly body weight gain, feed conversion ratio and performance index in broiler chickens

Weeks	Treatments					
	T0	T1	T2	T3	SEM	Level of significance
			Body weight gain (g/bird)			
I	$120.76^{b}\pm2.15$	$124.39^{b}\pm1.82$	$122.98^{b}\pm1.55$	$130.42^{a}\pm1.13$	3.26	*
II	271.20±7.15	276.38±4.40	281.56±5.88	282.01±4.54	13.01	NS
III	408.84±8.04	485.00±12.09	410.48±10.72	487.64±15.56	15.73	NS
IV	386.94±10.85	395.48±9.95	495.09±15.86	521.40±14.28	20.26	NS
V	442.88±12.70	456.29±14.52	468.20±13.60	590.70±15.98	39.52	NS
			Feed conversion ratio (FCR)			
I	$1.71^{a}\pm0.04$	$1.69^{b}\pm0.01$	$1.70^{b}\pm0.02$	$1.60^{c}\pm0.04$	3.26	*
II	1.68±0.05	1.66±0.03	1.65±0.02	1.58±0.02	5.67	NS
III	1.66±0.02	1.62±0.04	1.63±0.05	1.57±0.03	9.66	NS
IV	1.63±0.04	1.60±0.03	1.59±0.06	1.56±0.01	4.98	NS
V	1.61±0.06	1.57±0.07	1.55±0.03	1.52±0.03	9.01	NS
I to V	$1.62^{a}\pm0.02$	$1.58^{b}\pm 0.04$	$1.59^{b}\pm0.03$	$1.56^{ab}\pm0.01$	5.04	*
			Performance index (PI)			
I	$50.98^{a}\pm1.21$	$65.36^{b}\pm1.05$	$62.68^{b}\pm0.90$	$69.07^{b}\pm2.01$	3.26	**
II	258.16±4.89	288.40±6.13	281.12±3.98	285.97±5.41	13.01	NS
III	431.11±7.51	490.35±5.89	389.65±9.01	370.13±8.12	15.73	NS
IV	250.24±10.01	348.01±9.95	480.71±12.31	401.89±15.23	20.26	NS
V	299.06±14.54	301.96±11.12	309.32±19.01	493.64±13.01	39.52	NS
I to V	$1289.55^{a}\pm32.01$	$1497.79^{b}\pm35.50$	$1523.48^{b}\pm36.07$	$1616.99^{c}\pm32.19$	40.16	**

^{a,b,c} values with different superscripts in a row differ significantly, * = Significant ($P<0.05$), ** = Highly Significant ($P<0.01$), NS= Non-significant

inclusion of aloe vera and tulsi, especially in combination, enhances body weight gain and overall growth performance in broiler chickens.

Average body weight gain: The effects of dietary supplementation with aloe vera and tulsi powders on weekly body weight gain of broilers are summarized in Table 3. In the first week, body weight gain differed significantly (P<0.05) among treatments, with the highest gain observed in the combined supplementation group (T3: 130.42 g/bird), significantly greater than T0, T1, and T2, while the control (T0: 120.76 g/bird) recorded the lowest. In weeks II to V, no statistically significant differences were observed, although supplemented groups consistently showed numerically higher gains than the control. Week II gains were highest in T3 (282.01 g/bird), while week III gains were elevated in T3 (487.64 g/bird) and T1 (485.00 g/bird) compared to T0 (408.84 g/bird). In weeks IV and V, T3 maintained superior gains (521.40 and 590.70 g/bird, respectively). Overall, combined aloe vera and tulsi supplementation consistently enhanced body weight gain, with the greatest improvement in T3.

The present findings aligned partially with previous studies on herbal supplementation in broilers. Appusamy (2012) reported no significant effect of standardized Aloe vera extract on body weight gain, whereas Raziq *et al.* (2012) observed marked improvements with Aloe vera included in a herbal mixture. Similarly, Darabighane *et al.* (2012) reported higher gains with 1.5 - 2.5% aloe vera gel. Positive effects of tulsi supplementation are supported by Swathi *et al.* (2012), Bhosle *et al.* (2015), and Hasan *et al.* (2016), who documented significantly greater body weight gains in supplemented broilers. The current study demonstrates that combined supplementation of Aloe vera and tulsi consistently enhances weekly and cumulative body weight gain, confirming their synergistic potential in improving growth performance and overall productivity in broiler chickens.

Feed conversion ratio: The efficacy of aloe vera and tulsi powders as poultry feed additives was evaluated through feed conversion ratio (FCR), with results presented in Table 3. The overall mean FCR values were 1.62 (T0), 1.58 (T1), 1.59 (T2), and 1.56 (T3). Statistical analysis indicated a significant improvement (P<0.05) in FCR with dietary supplementation, highlighting enhanced feed efficiency in all treated groups compared to the control. The combined supplementation group (T3) demonstrated the most efficient FCR, reflecting a synergistic effect, while T0 recorded the least efficient feed conversion.

These findings corroborate previous studies. El Banna *et al.* (2013) reported improved FCR with aloe vera supplementation, while Raziq *et al.* (2012) observed enhanced feed conversion with aloe vera-based diets. Similarly, Swathi *et al.* (2012) and Bhosle *et al.* (2015) documented better feed efficiency in tulsi-supplemented broilers. Ashar *et al.* (2022) reported no significant effect of aloe vera powder on broiler FCR. Overall, these results indicate that aloe vera and tulsi, particularly in combination, improve nutrient utilization, reduce feed per unit weight gain, and serve as effective natural growth promoters in commercial broiler production.

Performance index: The effects of aloe vera and tulsi powder supplementation on weekly performance index (PI) of broilers are presented in Table 3. In the first week, significant differences (P<0.01) were observed, with T3 (combined aloe vera + tulsi) achieving the highest PI (69.07), followed by T1 (65.36) and T2 (62.68), while the control (T0) had the lowest (50.98), indicating enhanced early growth. Weeks II to V showed statistically insignificant differences (P>0.05) e.g., T2 recorded the highest PI in week IV, and T3 led in week V (493.64). Overall cumulative PI from week I to V differed significantly (P<0.01), with T3 achieving the highest (1616.99) versus T0 (1289.55), demonstrating superior overall performance. These results aligned with Srivastava *et al.* (2013), confirming that aloe vera and tulsi, particularly in combination, effectively enhanced growth and performance in broiler chickens.

Nutrient retention: The effects of aloe vera and tulsi supplementation on total tract nutrient retention in broilers are summarized in Table 4. Dietary inclusion of these herbal additives significantly improved dry matter (DM) retention (P<0.05), with the control group (T0) showing the lowest value (71.78%), while supplemented groups recorded higher retention, T1 (73.59%), T2 (74.11%), and T3 (74.71%). Crude protein (CP) retention was also significantly enhanced (P<0.05), with T0 at 63.43% and higher values in T1 (65.57%), T2 (66.09%), and T3 (66.30%), reflecting improved protein utilization. Ether extract (EE) retention followed similar trends (P<0.05), with T3 achieving the highest (77.75%) compared to T0 (74.68%). The combined supplementation (T3) exhibited

Table 4. Effect of dietary supplementation of aloe vera and tulsi powder on total tract nutrient retention (%) in broiler chickens

Parameters	Treatments				SEM	Level of significance
	T0	T1	T2	T3		
DM (%)	71.78^{a}±0.0	73.59^{b}±0.32	74.11^{c}±0.33	74.71^{c}±0.29	0.520	*
CP (%)	63.43^{a}±0.5	65.57^{b}±0.42	66.09^{c}±0.47	66.30^{c}±0.41	0.540	*
EE (%)	74.68^{a}±0.43	76.12^{b}±0.20	76.32^{b}±0.63	77.75^{c}±0.39	0.470	*
Ca (%)	44.02^{a}±0.88	44.52^{b}±0.27	45.91^{c}±1.20	45.72^{c}±0.68	0.419	*
P (%)	71.62 ±1.41	73.21 ±1.19	75.11 ±1.07	75.03 ±0.62	0.592	NS

^{a,b,c} values with different superscripts in a row differ significantly, * = Significant (P<0.05), NS= Non-significant

the most pronounced effect, suggesting a synergistic role of aloe vera and tulsi in enhancing digestibility, nutrient absorption, and bioavailability. These results indicated that these herbal additives can effectively improve feed efficiency and overall nutrient utilization in broiler chickens.

Calcium retention varied significantly ($P<0.05$) among treatments, with the control group (T0) showing the lowest value (44.02%). Supplementation with aloe vera and tulsi improved Ca retention in T1 (44.52%) and more notably in T2 (45.91%) and T3 (45.72%), indicating enhanced mineral absorption, possibly due to bioactive compounds and antioxidant properties facilitating nutrient availability at the tissue level. In contrast, phosphorus retention did not differ significantly ($P>0.05$) among treatments, although supplemented groups showed numerically higher values, T2 (75.11%) and T3 (75.03%) versus T1 (73.21%) and T0 (71.62%). These findings suggested a marginal positive effect of herbal supplementation on phosphorus utilization. Overall, dietary inclusion of aloe vera and tulsi effectively improved retention of dry matter, crude protein, ether extract, and calcium in broilers, with the combined supplementation (T3) showing the most pronounced benefits, while phosphorus retention remained statistically unchanged.

The cumulative results indicated that dietary supplementation with aloe vera and tulsi powders enhanced retention of dry matter (DM), crude protein (CP), ether extract (EE), and calcium (Ca), with the combination treatment (T3) showing the most consistent benefits. These improvements are likely to be due to the synergistic effects of bioactive compounds in both the herbs, which enhance digestive enzyme activity, gut health, and nutrient bioavailability (Kumar *et al.* 2010). Similar outcomes were reported by Akhtar *et al.* (2012), who observed better DM digestibility in broilers fed herbal additives. Polysaccharides in aloe vera are known to stimulate gut immunity and facilitate nutrient absorption (Chaudhary *et al.* 2014). Improved fat digestibility with herbal supplementation was documented by Mishra and Srivastava (2015), while Devi *et al.* (2017) reported enhanced Ca retention in broilers. These findings aligned with the previous studies confirming the efficacy of herbal feed additives in promoting nutrient utilization and overall growth performance in poultry (Srivastava *et al.* 2013).

The dietary supplementation of aloe vera (1.5%) and tulsi (1%) leaf powders, either individually or in combination, positively influenced growth performance and nutrient utilization in broiler chickens. While cumulative feed intake remained largely unaffected, supplemented groups, particularly the aloe vera + tulsi combination (T3), exhibited significantly higher body weight gain, improved feed conversion ratio, and superior performance index. Nutrient retention of DM, CP, EE, and Ca was also significantly enhanced, reflecting better digestibility and bioavailability.

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REFERENCES

Akhtar M, Hai A, Awais M M, Iqbal Z, Muhammad F and Anwar M I. 2012. Immunostimulatory and protective effects of Aloe vera against coccidiosis in industrial broiler chickens. *Veterinary Parasitology* **186**: 170–177.

Alemi I F, Mahdavi A, Ghazvinian K, Ghader M and Darabighane B. 2012. The effects of different levels of Aloe vera gel powder on antibody titer against Newcastle disease virus and performance in broilers. *Proceedings of International Poultry Scientific Forum*, Georgia World Congress Center, Atlanta, Georgia **47**: 23–26.

Aminullah N, Mostamand A, Zahir A, Mahaq O and Azizi M N. 2025. Phytogenic feed additives as alternatives to antibiotics in poultry production: A review. *Veterinary World* **18**(1): 141–154.

AOAC. 2005. *Official method of Analysis*. 18th Edition, Association of Officiating Analytical Chemists, Washington DC, Method 935.14 and 992.24.

Appusamy J. 2012. Effect of supplementation of Aloe vera extracts on growth performance in commercial broilers. *The Indian Journal of Field Veterinarians* **8**(1): 47–49.

Ashar J, Bhalerao S M, Khanvilkar A V, Kadam A S, Sonawane G S, Barate A K, Nagargoje S B, Kharde S R and Andhale B C. 2022. Effect of supplementation of Aloe vera (*Aloe barbadensis*) powder on performance of broiler chicken. *Indian Journal of Animal Nutrition* **39**(2): 205–211.

Bhosale D S, Bhagwat S R, Pawar M M and Kulkarni R C. 2015. Comparative efficacy of dietary addition of tulsi (*Ocimum sanctum*) leaf powder and vitamin E on broiler performance. *Indian Journal of Animal Nutrition* **32**(3): 348–350.

BIS. 2007. Indian standard, poultry feeds specifications, IS-1374:2007. *Bureau of Indian Standards*. 9, Bahadur Shah Zafar Marg, Manak Bhawan, New Delhi, India.

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* **24**(1):103–154.

Choudhary D, Kaur R, Chandrasekaran B, Rani N, Kumar B, Mannan A, Rawat R, Eyupoglu V, Marwaha M and Singh T G. 2025. Exploring phyto-resources of Tulsi for the management of depression: a discovery through computational and pharmacological studies. *Chemistry Africa.* https://doi.org/10.1007/s42250-025-01438-2

Choudhary M, Kochhar A and Sangha J. 2014. Hypoglycemic and hypolipidemic effect of Aloe vera L. in non-insulin dependent diabetics. *Journal of Food Science and Technology* **1**(1): 90–96.

Darabighane B, Zarei A and Shahneh A Z. 2012. The effects of different levels of Aloe vera gel on ileum microflora population and immune response in broilers: A comparison to antibiotic effects. *Journal of Applied Animal Research* **40**: 31–36.

Devi P C, Samanta A K, Das B and Kalita G. 2015. Effect of plant extracts and essential oil blend as alternatives to antibiotic

growth promoters on growth performance, nutrient utilization and carcass characteristics of broiler chicken. *Indian Journal of Animal Nutrition* **35**(4): 421.

Durrani F R, Ullah S, Chand N, Durrani Z and Akhtar S. 2008. Using aqueous extract of aloe gel as anticoccidial and immunostimulant agent in broiler production. *Sarhad Journal of Agriculture* **24**(4): 665–670.

El-Banna H A, El Latif A A and Soliman M. 2013. Anticoccidial activity of *Allium sativum* and Aloe vera in broiler chickens. *International Journal for Agro Veterinary and Medical Sciences* **7**(4): 117–125.

Hasan M N, Mostofa M, Sorwar M G, Hasan M T, Das K and Hossain D M N. 2016. Effects of Tulsi leaf extract on body weight gain in broiler production. *Bangladesh Journal of Veterinary Medicine* **14**(1): 21–25.

Hassanbeigy-Lakeh Z, Roustaee Ali-Mehr M and Haghighian-Roudsari M. 2012. Effect of aloe gel on broiler performance. Proceeding of 5th Iranian Congress on Animal Science, Isfahan, Iran, pp. 973–977.

Kumar K P S, Bhowmik D, Chiranjib and Biswajit. 2010. Aloe vera: a potential herb and its medicinal importance. *Journal of Chemical and Pharmaceutical Research* **2**(1): 21–29.

Lanjewar R D, Zanzad A A, Ramteke B N and Deshmukh G B. 2009. Effect of dietary supplementation of tulsi (*Ocimum sanctum*) leaf powder on the growth performance and serum lipid profile in broilers. *Indian Journal of Animal Nutrition* **25**(4): 395–397.

Mehala C and Moorthy M. 2008. Effect of aloe vera and *Curcuma longa* (turmeric) on carcass characteristics and biochemical parameters of broilers. *International Journal of Poultry Science* **7**(9): 857–861.

Mishra S and Srivastava A. 2015. To study the physico-chemical properties of bael and aloe vera blended beverages. *International Journal of Science and Research* **4**(9): 642–645.

Moorthy M, Saravanan S, Mehala C, Ravi S, Ravikumar M, Viswanathan K and Edwin S C. 2009. Performance of single comb white leghorn layers fed with aloe vera, curcuma longa (turmeric) and probiotic. *International Journal of Poultry Science* **8**(8): 775–778.

Ravindran V. 2013. Feed enzymes: The science, practice, and metabolic realities. *Journal of Applied Poultry Research* **22**(3): 628–636.

Raziq F, Khan S, Chand N, Sultan A, Mushtaq M, Rafiullah R, Suhail S and Zeb A. 2012. Effect of water-based infusion of *Aloe barbedensis*, *Pimpinella anisum*, *Berberis lycium*, *Trigonella foenum-graecum* and *Allium sativum* on the performance of broiler chicks. *Pakistan Veterinary Journal* **32**: 593–596.

Sheoran N, Kumar R, Kumar A, Batra K, Sihag S, Maan S and Maan N S. 2017. Nutrigenomic evaluation of garlic (*Allium sativum*) and holy basil (*Ocimum sanctum*) leaf powder supplementation on growth performance and immune characteristics in broilers. *Veterinary World* **10**(1): 121–129.

Singh V, Amdekar S and Verma O. 2010. *Ocimum sanctum* (Tulsi): Bio-pharmacological Activities. *Web med Central Pharmacology* **1**(10): 1046.

Snedecor G W and Cochran W G. 1994. *Statistical Methods*. 9th edn. The Iowa State University Press, Ames, Iowa.

SPSS. 2011. *Statistical Packages for Social Sciences Version 20.0*. SPSS, Chicago, IL, USA.

Srivastava S B, Niwas R, Singh D P and Bisen B R. 2013. Impact of herbal based diets on production efficiency of broiler. *The Bioscan* **8**(1): 119–122.

Swathi B, Gupta P S P and Nagalakshmi D. 2012. Effect of Tulsi (*Ocimum sanctum*) and Turmeric (*Curcuma longa*) on broiler performance and blood constituents during heat stress in broilers. *International Journal of Pharma and Bio Sciences* **3**(3): 446–453.

Talapatra S K, Roy S C and Sen K C. 1940. The analysis of mineral constituents in biological materials. I. Estimation of phosphorus, calcium, magnesium, sodium and potassium in food stuffs. *Indian Journal of Veterinary Science and Animal Husbandry* **10**: 243–258.

Tanwar R, Sharma V, Karnani M, Choudhary S and Manju. 2022. Effects of supplementation of aloe vera (*Aloe barbadensis*) and tulsi (*Ocimum sanctum*) as feed additives on performance of broiler chickens. *Indian Journal of Animal Nutrition* **38**(3): 304–309.

Vasanthakumar P, Sasikumar P, Pangayarselvi B, Chandrasekaran D, Doraisamy K A, Senthilkumar S and Purushothaman M R. 2013. Performance of broiler chicken fed tulsi leaf powder and leaf extract supplemented diets during summer to alleviate heat stress. *The Indian Journal of Animal Sciences* **83**(9): 930–931.