



Effects of Supplementation of Aloe vera (*Aloe barbadensis*) and Tulsi (*Ocimum sanctum*) as Feed Additives on Performance of Broiler Chickens

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ABSTRACT

A study was carried out to investigate the efficacy of dietary supplementation of Aloe vera (*Aloe barbadensis*) and Tulsi (*Ocimum sanctum*) powder as a feed additive on growth performance, feed consumption, and feed conversion efficiency of broilers. The experiment was conducted in a completely randomized design with a total of 240-day-old broiler chicks (Vencobb) randomly assigned to four treatment groups with four replicates having 15 birds in each replicate for a period of five weeks. Birds were offered the maize-soybean based basal diet. The treatment groups consisted of control group (T₁) fed only basal diet without additive, T₂ supplemented with 0.5% Aloe vera powder, T₃ supplemented with 0.5 % Tulsi powder and T₄ supplemented with 0.25 % Aloe vera powder + 0.25 % Tulsi powder in the diet. No significant effect on feed intake was observed among different groups due to supplementation of feed additives. The final body weight and body weight gain were significantly (P<0.01) higher in groups supplemented with either Aloe vera, Tulsi or both as compared to control. Feed conversion ratio in the T₂ group was significantly (P<0.05) improved in comparison to other groups. Dressing % was not significantly different among the groups. It was concluded that the use of polyherbal supplement in the form of Aloe vera and Tulsi as feed additives at a level of 0.5 % and 0.25%, and a combination of both enhanced the overall performance of broiler chicken.

Key words: Aloe vera, Broilers, Feed additives, Growth performance, Tulsi

INTRODUCTION

Poultry is one of the rapidly developing sectors of Indian agriculture today, with an annual growth rate of 11.4 per cent, India is the fourth largest producer of chicken in the world with 3.9 million metric tons after US, China and Brazil (USDA, 2015) and it is approaching 4.2 MMT. Poultry production, particularly broiler production is the quickest way to increase the availability of high quality protein for human consumption (Karnani *et al.*, 2019). The broiler industry has grown due to consumer demand for affordable poultry meat. Poultry feed industry is facing increased pressure from consumers to reduce the use of antibiotic growth promoters (AGPs) in poultry diets. Plant extracts and various phytobiotic that originate from leaves, roots, tubers or fruits of herbs, spices and other plants have shown to be excellent growth enhancers in poultry (Steiner *et al.*, 2013; Wallace *et al.*, 2010).

In the present research, two medicinal plants Tulsi

and Aloe vera were tested as feed additives in the poultry diet. Major ingredients of Aloe vera include anthraquinones, saccharides, vitamins, enzymes, and low-molecular-weight compounds (Choi and Chung, 2003) which give Aloe vera its anti-inflammatory, immunomodulatory, wound-healing, anti-viral, anti-fungal, anti-tumor, anti-diabetic, and anti-oxidant effects (Christaki and Florou-Paneri, 2010).

Ocimum sanctum (Tulsi) is reported to possess anti-infertility, anticancer, antibacterial (Joshi *et al.*, 2009), antidiabetic, antifungal, antimicrobial, hepatoprotective, cardioprotective, antiemetic, antioxidant (Subramanian *et al.*, 2005), antispasmodic, analgesic, anti-ulcerogenic and ulcer healing properties, adaptogenic (Singh *et al.*, 2010) and diaphoretic actions (Mondal *et al.*, 2009). It was hypothesized that these two herbal ingredients would improve performance of broilers either alone or in combination. Therefore, the present experiment was planned to study the effect of

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dietary Aloe vera and Tulsi powder on the performance of broiler chickens.

MATERIALS AND METHODS

The present experiment was carried out at Post Graduate Institute of Veterinary Education and Research (PGIVER), Jaipur. Two hundred and forty day-old, unsexed, apparently healthy broiler chicks of Cobb-400 strain were individually weighed (almost similar average weight) and randomly divided into four groups with four replicates having 15 chicks in each replicate by completely randomized design. The required quantities of the feed ingredients and feed additives such as Aloe vera and Tulsi for formulations of experimental diets were procured from the local market of Jaipur, Rajasthan. The control group T_1 was fed basal maize soybean based diet (Feed without additives), T_2 : 0.5% Aloe vera powder, T_3 : 0.5% Tulsi powder and T_4 : 0.25% Aloe vera and 0.25% Tulsi powder. The broiler pre starter, starter and finisher rations were formulated as per the ICAR, 2013. The feed was offered *ad libitum* to each group throughout the experimental period and group-wise feed consumption was recorded at weekly intervals.

The body weight of the experimental broilers was recorded at beginning of the experiment and thereafter at weekly interval to assess the body weight change and the growth pattern. The weighing of the birds was done in the early hours of the day before feeding, using an electronic scale. Live weight gain at weekly interval was calculated from difference in body weight attained between the two consecutive weeks. Feed conversion ratio (FCR) was calculated by dividing the cumulative feed intake by body weight gain of chicks for every week. In order to take into account the feed efficiency as well as the growth rate, an index (Performance Index (PI)) was obtained for each treatment by dividing the average weight gained by the feed conversion ratio. Protein efficiency ratio (PER) was calculated by dividing the weight gain by protein consumed. A nitrogen balance study was conducted using 12 chicks from each group for 5 days at the end of feeding trial. During this period the twelve birds from each treatment

were transferred to separate pens and polythene sheet of appropriate size was spread over the ground for collection of mixed excreta in each group. The chicks were offered a weighed amount of experimental ration at a fixed morning hour (9:30 AM) every day during the trial period. The mixed droppings were collected at the end of every 24 hours and pooled to get the total excreta voided during the trial period. Daily feed intake was calculated after deducting the left over from the feed offered. Representative feed samples were drawn from the bulk, dried, ground and stored in sample bottles for analysis. The group wise aliquots from droppings after thorough mixing with the help of spatula were drawn for nitrogen estimation. For nitrogen estimation, samples in duplicate were preserved in 5 per cent sulphuric acid in wide-mouth glass stoppered bottles and kept in refrigerator. Dry matter determination of excreta was done with duplicate sample for each group by keeping the weighed excretal material in an oven at 85°C till constant weight was obtained. Proximate composition of the herbs, nitrogen content of feed and excreta were estimated by following the methods of AOAC (2005).

To study the effect of different treatments on dressing percentage, twelve representative birds from each group were sacrificed at the end of 5th week. The selected birds were weighed individually and allowed to fast for 12 hour to empty gut contents before sacrifice. The broilers were sacrificed as per standard procedure (Panda, 1995) by severing the occipito-atlantal joint and allowed to bleed completely. The birds were de-feathered in defeathering machine after scalding and carcasses were eviscerated to measure dressing percentage. Data obtained were analyzed using standard procedure (Snedecor and Cochran, 1989). Treatment means were separated using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Ingredient and nutrient compositions of the experimental diets are presented in Tables 1 and 2. All the diets provided adequate amount of crude protein and metabolizable energy to meet requirements (ICAR,

Table 1. Ingredient and proximate composition of pre- starter, starter and finisher diets on dry matter basis

Ingredients	Pre-starter(%)	Starter (%)	Finisher (%)
Maize	55.1	58.02	62.2
Soyabean meal	37.2	34.01	30.1
Oil	3.0	3.0	3.0
Stone grit	1.65	1.60	1.85
Di-calcium phosphate	1.85	1.90	1.65
Salt	0.40	0.40	0.40
DL- Methionine	0.23	0.19	0.16
Lysine	0.19	0.14	0.12
Vitamin and mineral premix	0.5	0.5	0.5
Metabolizable energy (kcal/kg)	3015	3050	3095
Crude protein (%)	22.01	21.6	19.45

2013). The average total feed consumption in terms of g/bird in various treatment groups was found to be similar (Table 3). However, numerically highest total feed intake was found in T₃ group followed by T₄, T₁ and T₂ groups. No adverse effect of smell or taste of Aloe vera and Tulsi powder was found on the feed intake of broilers. Similarly, Hassanbeigy *et al.* (2004) found no significant effect on feed intake due to inclusion of Aloe vera at 0.6, 1.2, 1.8, 2.4 and 3 ml/l in drinking water. However, others research workers (Fallah, 2015; Darabighane *et al.*, 2017; Singh *et al.*, 2017) found increased feed intake when Aloe vera gel was added in the diet of broilers. On the other hand, other report (Eevuri and Putturu, 2013) indicated decreased feed intake due to dietary addition of turmeric, tulsi, amla and Aloe vera in broiler's diet. Yet other reports (Vasanthakumar *et al.*, 2013; Bhosale *et al.*, 2015; Hasan *et al.*, 2016) indicated no significant ($P>0.05$) effect of Tulsi on feed intake of broiler chicks.

Birds of treatment groups supplemented with Aloe vera and Tulsi powder and their combination attained significantly ($P<0.01$) higher body weight as compared to control. The highest total body weight was recorded in T₃ group followed by T₂ and T₄ groups. No significant difference was found among feed additives supplemented groups. These findings are in accordance with previous reports (Appusamy, 2012; Hassanbeigy *et al.*, 2012; Eevuri and Putturu, 2013; Singh *et al.*, 2014a; Fallah, 2015; Darabighane *et al.*, 2017; Singh *et al.*, 2017) which also found that the Aloe vera supplemented groups gained significantly higher final body weights than untreated groups. The significant improvement in body weight on account of supplementation of Tulsi was also reported earlier (Lanjewar *et al.*, 2008; Nath *et al.*, 2012; Khatun *et al.*, 2013; Alam *et al.*, 2015; Bhosale *et al.*, 2015 and Hasan *et al.*, 2016). The body weight gain was significantly ($P<0.01$) higher in groups having herbal feed

Table 2. Proximate composition of Aloe vera and Tulsi powder

Proximate Principle	Aloe vera powder	Tulsi powder
Dry matter (%)	91.62	93.00
	on % dry matter basis	
Crude protein (%)	10.21	16.05
Ether extract (%)	1.76	2.36
Crude fibre (%)	10.52	15.29
Total ash (%)	17.45	14.83

additives as compared to control group. Among herbs supplemented group highest body weight gain was found in T₃ group supplemented with Tulsi. Our results corroborate well with previous reports (Swati *et al.*, 2012; Bhosale *et al.*, 2015; Hasan *et al.*, 2016) which also observed significantly higher body weight gain of diet supplemented with Tulsi. Mmereole (2011) reported that the body weight gain was significantly higher in the birds fed diet that containing 1 per cent Aloe vera leaves powder than the birds fed control diet. Contrary to this, Singh *et al.* (2014b) reported that inclusion of 1, 1.5 and 2% whole leaf Aloe vera powder in diet of broilers had no significant effect on weight gain and final body weight.

Results revealed that birds of T₂ group showed significantly ($P<0.05$) improved FCR as compared to T₁ and T₄ groups, whereas no significant difference was found with T₃ group. Similarly, Namagirilakshmi, (2005) reported that supplementation of Aloe vera, probiotics and turmeric in chicken diet showed better feed efficiency. The results obtained are in accordance with finding of previous research workers (Raziq *et al.*, 2012; Shokraneh *et al.*, 2016) who reported better FCR in Aloe vera added groups. Results obtained in this study are also in agreement with other reports (Khatun *et al.*, 2013; Bhosale *et al.*, 2015) that reported improvement in FCR with the inclusion of Tulsi as a feed additive in the diet of broilers.

Performance index was significantly ($P<0.05$) higher in herbal products supplemented groups than in

control group, there was no significant difference between Aloe vera and Tulsi supplemented groups. Srivastava *et al.* (2013) observed significant difference in performance index in broiler fed diet with herbal drugs. Karnani *et al.* (2018) found significantly higher performance index when feed was supplemented with curry leaves powder. The results obtained from this study are in agreement with the findings of Patel *et al.* (2014) who recorded similar effects on performance index due to supplementation of garlic in the poultry ration. The protein efficiency ratio was significantly ($P<0.01$) higher in T₂ and T₃ groups as compared to T₁ and T₄ groups. Results obtained in the study corroborate well with the findings of Karnani *et al.* (2018) who found significant improvement PER due to supplementation of curry leaves powder in broilers.

Nitrogen balance was significantly ($P<0.01$) higher in herbs supplemented group than control group. No significant difference was there between Aloe vera and Tulsi supplemented groups. However, Dwivedi (2013) recorded no effect of phytobiotic or herb supplementation on nitrogen balance. This could be due to species and form of herbs used.

No significant difference was found among the treatment groups due to supplementation of Aloe vera and Tulsi alone and their blend on dressed weight of carcass. Apparently, highest dressed weight was recorded in T₃ followed by T₂, T₄, and T₁. Sinurat *et al.* (2002) reported that supplementation of fresh Aloe vera

Table 3. Effect of Aloe vera and Tulsi powder on performance of broiler chickens

Particulars	Treatments				P- value
	T ₁	T ₂	T ₃	T ₄	
Avg. total feed intake (g)	3039±51	2995±80	3180±59	3131±30	NS
Final body weight (g)	1952 ^a ±10.7	2070 ^b ±36.7	2117 ^b ±30.6	2046 ^b ±17.9	**
Total body weight gain (g)	1912 ^a ±10.7	2023 ^b ±36.8	2074 ^b ±30.8	2005 ^b ±18	**
Feed conversion ratio	1.58 ^b ±0.02	1.47 ^a ±0.04	1.53 ^{ab} ±0.01	1.56 ^b ±0.018	*
Performance index	1290 ^a ±7.56	1482 ^b ±57.5	1433 ^b ±27.4	1389 ^{ab} ±36.0	*
Protein efficiency ratio	2.79 ^a ±0.03	3.10 ^c ±0.08	2.97 ^{bc} ±0.03	2.92 ^{ab} ±0.03	**
Dressing %	70.2±0.02	70.04±0.19	70.42±0.92	69.56±0.34	NS
Nitrogen balance	1.06 ^a ±0.239	1.92 ^b ±0.043	1.92 ^b ±0.20	1.86 ^b ±0.016	**

^{a,b}Means superscripted with different letters within a column differ significantly from each other

gel (0.25 g/kg) and dry Aloe vera gel (0.25 and 1.0 g/kg) in broiler diet from 1 day old to 5 weeks of age showed no significant effect on carcass yield and internal organs. Mehala *et al.* (2009) also reported that dietary inclusion of Aloe vera in broiler diet has no significant effect in carcass quality. Contrary to this, Durrani *et al.* (2006) reported higher dressing percentage, breast, thigh and giblet weight in broilers fed diet contains 0.5% turmeric.

CONCLUSIONS

It was concluded that addition of 0.5% Aloe vera and 0.25 % Tulsi and blend of both (1:1) at 0.5% in the diet caused significant improvement in weekly weight gain and feed efficiency as compared to that of control group of broiler. Thus, polyherbal supplementation in the broiler rations may be useful for the safe, economical and efficient production of broiler and this formulation could be used as an alternative to commercial growth promoters.

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