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## Efficacy of *Ocimum sanctum* (Tulsi) and *Aloe vera* leaves powder as phytogetic growth promoter in diet of broiler chickens

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### Abstract

A study was carried out to assess the efficacy of Tulsi and *Aloe vera* leaves powder as a phytogetic growth promoter in the diet of broiler chickens. A total of two hundred, day old broiler chicks of Cobb-400 strain were divided into four treatment groups with 5 replicates of 10 chicks in each and were assigned to four iso-nutritive diets, viz., T<sub>1</sub>: Control (Feed without additive), T<sub>2</sub>: Tulsi leaves powder addition in feed @ 0.5%, T<sub>3</sub>: *Aloe vera* leaves powder addition in feed @ 0.5% and T<sub>4</sub>: Addition of both Tulsi and *Aloe vera* leaves powder in feed @ 0.5%. The feeding experiment was carried out for 42 days and feed intake, weight gain, feed conversion ratio and economics of feeding were evaluated. The results showed that there was no significant effect of the addition of mixture of Tulsi and *Aloe vera* leaves powder on overall feed intake of experimental birds. The final body weights and body weight gains were significantly higher in birds supplemented with either Tulsi, *Aloe vera* leaves powder or both as compared to the control. Feed conversion ratio in the T<sub>4</sub> group was significantly ( $p < 0.05$ ) improved as compared to control, whereas, T<sub>3</sub> and T<sub>2</sub> groups showed non-significant difference from control as well as from T<sub>4</sub> group. When profit over control in terms of rupees per bird was calculated, it was found to be 3.57, 2.63 and 0.02 more profit in T<sub>4</sub>, T<sub>3</sub> and T<sub>2</sub> respectively. It is concluded that dietary addition of Tulsi and *Aloe vera* leaves powder in combination at 0.5% improves broilers performance.

**Keywords:** *Aloe vera*, broiler chickens, body weight, feed intake, Tulsi

### Introduction

Recent trend in broiler production is to offer feed containing the feed additives to improve the feed efficiency and obtain maximum returns in the shortest possible time. Various types of feed additives such as antibiotics, enzymes, hormones, prebiotics, probiotics, herbal products, etc. are used as growth stimulants in poultry production. Medicinal herbs, as a new class of additives to animal and poultry feeds, have beneficial properties such as anti-oxidant, anti-microbial and anti-fungal [1] as well as immuno-modulatory and anti-coccidial effects, which lead to increased use of herbs. Herbal feed additive also improves nutrient utilization, absorption and the stimulation of the immune system. These additions in the broiler diet have been shown to overall performance of birds [2, 3, 4, 5]. The possible mechanisms of action of herb in the animal for growth promotion include changes in the intestinal microbiota, increased digestibility and nutrient absorption; enhanced nitrogen absorption, improvement of the immune response, morphological and histological modifications of the gastrointestinal tract and antioxidant activity. Tulsi (*Ocimum sanctum*) is considered to be the "Queen of herbs" due to its greater medicinal values. The use of Tulsi as an aromatic plant has been well documented in Ayurveda. It belongs to the family *Labiataeae*. Name "Tulsi" in Sanskrit means "the incomparable one". Whole plant is used as a source of remedy [6]. Tulsi, known for its antimicrobial, immuno-modulatory, anti-stress, anti-inflammatory, anti-pyretic, anti-asthmatic, hypo-glycaemic, hypo-tensive and analgesic activities. The main constituents responsible for these properties are eugenol, ascorbic acid, b-carotene, b-sitosterol, palmitic acid and tannins [7]. The major chemical constituent of dried leaves is eugenol, associated with its therapeutic potential [8]. Tulsi has also been shown to counter metabolic stress through normalization of blood glucose, blood pressure and lipid levels, and psychological stress through positive effects on memory and cognitive function and through its anxiolytic and anti-depressant properties.

*Aloe vera* derives its name from the Arabic word "Alloeh" which means "shining bitter substance" because of the bitter liquid found in the leaves and vera which means "true" in

Latin. Locally *Aloe vera* is known as “Ghritokumari” and is used as an ingredient of herbal formulation. *Aloe vera* is a tropical plant of the genus *Aloe* and belongs to the *Liliaceae* family. *Aloe vera* gel contains compounds with proven antibacterial, antiviral, antifungal, antioxidant, anti-inflammatory, anti-diabetic, immuno-modulatory and wound healing properties [9]. *Aloe vera* its anti-inflammatory, wound-healing, anti-viral, anti-fungal, anti-tumor, anti-diabetic and anti-oxidant properties [10]. Therefore, the present study was planned to evaluate the beneficial effect of Tulsi and *Aloe vera* leaves powder supplementation on the performance of broiler chickens.

## 2. Materials and Methods

The present experiment was carried out at Poultry unit of Instructional Livestock Farm Complex, College of Veterinary Science and Animal Husbandry, Junagadh Agricultural University, Junagadh. Total 200 day-old broiler chicks of Cobb-400 strain with average body weight of 45 g were wing banded and distributed randomly into four groups having five replicates of 10 birds in each by completely randomized design and were assigned to four iso-nutritive diets, viz., T<sub>1</sub>: Control (Feed without additive), T<sub>2</sub>: Tulsi leaves powder addition in feed @ 0.5%, T<sub>3</sub>: *Aloe vera* leaves powder addition in feed @ 0.5% and T<sub>4</sub>: Addition of both Tulsi and *Aloe vera* leaves powder in feed @ 0.5%. Tulsi and *Aloe vera* leaves powder were procured from local market Junagadh. Ingredients composition of these starter and finisher rations are presented in Table 1. All the experimental birds were reared in well ventilated shed in deep litter pens and reared under uniform management conditions. They fed with organic chromium powder supplementation as per treatments and clean drinking water was supplied to the birds *ad-libitum* throughout the study period to meet the nutrient as per BIS [11]. All the birds were weighed weekly in the morning, before feeding and watering. Feed intake was calculated by measuring the amount of feed offered and residue left after 24 hours. Feed conversion ratio was calculated by dividing the feed intake with weight gain. Vaccination and other routine poultry management practices were carried out neatly. While calculating the economics, the cost of chicks, brooding, labour, etc. were identical for all the groups hence ignored. Total feed cost was calculated by considering feed cost as variable and comparative economics was calculated for all the experimental groups. Average final body weights of the birds were recorded at the end of the experiment. Selling price per kg live weight was 66 rupees. Return over feed cost for particular group was calculated by the income from sale of birds subtracted by the cost incurred on total feed consumed by the group.

The respective cumulative samples of feed and residues were ground and used for further analysis. Representative samples of feeds were analyzed for proximate composition using standard methods of AOAC [12]. The proximate composition of Tulsi and *Aloe vera* leaves powder presented in Table 2. The data generated during this experiment were subjected to statistical analysis using one way ANOVA as described by Snedecor and Cochran [13]. The significance of mean difference was tested by Tukey [14] post hoc test.

## 3. Results and Discussion

Chemical composition of starter and finisher feed is given in Table 3. The diets fed to different treatment groups were found to be iso-nitrogenous and comparable with respect to

their proximate composition. Results revealed non-significant effect of Tulsi and *Aloe vera* supplementation on total feed intake (Table 4). However, numerically highest total feed intake was found in T<sub>3</sub> group followed by T<sub>1</sub>, T<sub>4</sub> and T<sub>2</sub> groups. It has shown that there is no adverse effect of smell and/or taste of Tulsi and *Aloe vera* leaves powder on the palatability of feed in the diets of broilers. Similar finding were also reported by many workers. Lanjewar [15], Kumar [16] and Bhosale [2] reported non-significant ( $p>0.05$ ) effect of Tulsi leaves powder (0.5%) supplementation on feed intake in broilers. Similarly, Amaechi and Iheanetu [17] and Yadav [18] reported non-significant ( $p>0.05$ ) effect of *Aloe vera* leaves powder (0.5%) supplementation on feed intake in broilers.

The final body weights revealed that birds of T<sub>4</sub> group attained significantly ( $p<0.05$ ) higher body weight as compared to control while were not significantly different from T<sub>2</sub>, T<sub>3</sub>, group which are also statistically similar to each other and with control (Table 4). The highest total body weight of experimental birds was observed in T<sub>4</sub> group supplemented with Tulsi and *Aloe vera* leaves powder in combination. However, Tulsi and *Aloe vera* alone did not exert any significant effect on body weight of birds. These findings are in accordance with the findings of many workers [2, 15, 16] reported non-significant ( $p>0.05$ ) effect of Tulsi leaves powder (0.5%) supplementation on body weight in broilers. In contrast, some workers [17, 18] reported non-significant ( $p>0.05$ ) effect of *Aloe vera* leaves powder (0.5%) supplementation on body weight in broilers. The total body weight gain (g/bird) in T<sub>3</sub> and T<sub>4</sub> groups was significantly higher than T<sub>1</sub> and T<sub>2</sub> which are non-significantly different from each other (Table 4). It indicates non-significant effect of Tulsi supplementation, significant effect of *Aloe vera* as well as the combination of Tulsi and *Aloe vera* supplementation on total body weight gain of broilers. The results are corroborated with the findings of [15, 16] who reported non-significant ( $p>0.05$ ) effect of Tulsi leaves powder (0.5%) supplementation on body weight gain in broilers. The higher weight gains observed in Tulsi and vitamin E groups were probably due to adaptogenic, antimicrobial, immunomodulator, antistress properties of Tulsi [19]. Doley [20] reported significantly ( $p<0.05$ ) increased body weight gain on supplementation of *Aloe vera* leaves powder (0.5%). Mekala [21] and Singh [22] also reported significantly ( $p<0.05$ ) increased body weight gain on supplementation of *Aloe vera* gel at different levels in broilers. The higher body weight gain on *Aloe vera* supplementation may be due to antibacterial properties and improvement in immune response as these two factors may contribute to better growth performance in broilers.

Result revealed that birds of T<sub>4</sub> group showed significantly ( $p<0.05$ ) improved FCR as compared to control group, whereas, T<sub>3</sub> and T<sub>2</sub> groups showed non-significant difference from control as well as from T<sub>4</sub> group (Table 4). Improved FCR in T<sub>4</sub> was due to higher weight gain compared to control and other treatment groups which shows positive cumulative effect of supplementation of Tulsi and *Aloe vera* leaves powder in combination. However, either Tulsi leaves powder or *Aloe vera* leaves powder alone did not exerted any significant effect on FCR. In support of present findings [2, 15] who reported non-significant ( $p>0.05$ ) effect of Tulsi leaves powder (0.5%) supplementation on feed conversion ratio in broilers, as well as, the non-significant ( $p>0.05$ ) effect of *Aloe vera* leaves powder (0.5%) supplementation on feed conversion ratio in broilers was also reported earlier by some

workers [18, 20]. Average income from selling of birds in terms of (Rs./bird) and feed cost of broilers under different treatment groups has been shown in Table 5 and Table 6. The total income through sale of chicken was (Rs.) 7128, 7194, 7458 and 7557 in T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> groups, respectively. The total return over feed cost was (Rs.) 1997.44, 1998.00, 2128.49 and 2175.78 in T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> groups, respectively. The profit over control in terms of rupees per bird was

calculated, it was found to be 3.57, 2.63 and 0.02 more profit in T<sub>4</sub>, T<sub>3</sub> and T<sub>2</sub> groups, respectively. By observing the data of profit/ bird over control, it is clear that maximum benefit was observed in group supplemented with combination of Tulsi and *Aloe vera* followed by *Aloe vera* alone supplemented group, whereas, negligible or no profit was observed in Tulsi supplemented group.

**Table 1:** Ingredients composition of feed

Ingredients	Broiler Starter (Kg)	Broiler Finisher (Kg)
Maize	61.00	64.00
Soya bean DOC	33.27	28.40
Calcite Powder	1.25	1.25
DCP	1.00	1.00
Vitamins	0.05	0.05
Vitamin B <sub>12</sub>	0.01	0.01
Trace minerals	0.10	0.10
Choline Chloride 60%	0.10	0.10
Lysine	0.25	0.16
Methionine	0.18	0.15
Phytase	0.01	0.01
Enzyme	0.05	0.05
Salt	0.10	0.10
Sodium Bicarbonate	0.36	0.35
Liver Tonic	0.10	0.10
Immuno-modulator	0.05	0.05
Toxin Binder	0.10	0.10
Growth promoter	0.02	0.02
Anti-coccidial	0.05	0.05
Emulsifier	0.05	0.05
Oil	1.90	3.90
Total (Kg)	100.00	100.00
Cal. ME (Kcal/Kg)	2936	3083

**Table 2:** Proximate composition of Tulsi and *Aloe vera* leaves powder (on % DM basis)

Composition	Tulsi leaves powder	<i>Aloe vera</i> leaves powder
Dry Matter	93.33	91.30
Organic Matter	90.00	84.50
Crude Protein	5.07	9.31
Crude Fiber	6.20	5.75
Ether Extract	1.83	1.49
Nitrogen Free Extract	76.90	67.95
Total Ash	10.00	15.50

**Table 3:** Proximate composition of experimental feeds (on %DM Basis)

Nutrient	Treatments							
	Starter Feed				Finisher Feed			
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
DM	89.90	90.26	89.46	90.00	90.86	89.73	89.93	90.03
OM	93.00	92.60	92.60	92.50	92.80	93.10	92.70	92.40
CP	22.44	22.31	22.44	22.30	20.21	20.42	20.21	20.47
EE	4.33	5.33	4.49	4.49	4.50	4.99	4.16	4.99
CF	4.25	3.75	3.75	4.25	3.00	3.00	3.25	2.75
NFE	61.98	61.21	61.92	61.46	65.09	64.69	65.08	64.19
TA	7.00	7.40	7.40	7.50	7.20	6.90	7.30	7.60
Ca	0.92	0.95	0.94	0.93	0.98	0.93	0.97	0.95
P	0.46	0.51	0.53	0.52	0.53	0.51	0.52	0.54

EE=Ether extract, DM=Dry matter, OM=Organic matter, CP=Crude protein, CF=Crude fiber, NFE=Nitrogen free extract, TA= Total ash, Ca= Calcium, P=Phosphorus

**Table 4:** Performance of experimental birds

Particulars	Treatments				p value
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	
Initial body weight (g)	45.00	43.16	44.70	44.18	NS
Av. total feed intake (g)	4055.62	3963.66	4090.14	3993.24	NS
Final body weight (g)	2160.70 <sup>b</sup>	2178.84 <sup>ab</sup>	2264.24 <sup>ab</sup>	2289.42 <sup>a</sup>	*
Total weight body gain (g)	2115.70 <sup>b</sup>	2135.68 <sup>b</sup>	2219.54 <sup>a</sup>	2245.24 <sup>a</sup>	**
Feed conversion ratio	1.92 <sup>b</sup>	1.86 <sup>ab</sup>	1.84 <sup>ab</sup>	1.78 <sup>a</sup>	*

Means with different superscripts within the treatment groups differs significantly (\* $P < 0.05$ , \*\* $P < 0.01$ , NS: Not significant)

**Table 5:** Cost of feeds under different feed supplement groups

Particulars	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
<b>Type of feed</b>				
Broiler starter (Rs./kg)	24.79	25.69	25.54	26.44
Broiler finisher (Rs./kg)	25.53	26.43	26.28	27.18

**Table 6:** Return over feed cost realized under different feed supplement groups

Particulars	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
Total income through sale of birds (Rs.)	7128	7194	7458	7557
Total return over feed cost (Rs.)	1997.44	1998	2128.49	2175.78
Profit/ chick (Rs.)	39.94	39.96	42.57	43.51
Profit over control/chick (Rs.)	0.00	0.02	2.63	3.57

#### 4. Conclusion

Based on the results, it is concluded that dietary addition of both Tulsi and *Aloe vera* leaves powder @ 0.5% in the diet of broiler chickens improved body weight gain, feed conversion ratio, return over feed cost and profit per bird. However, it did not have an effect on overall feed intake. Thus, Tulsi and *Aloe vera* leaves powder may be used as phyto-genic growth promoter in broilers instead of antibiotics.

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