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Effect of supplementation of tulsi (*Ocimum sanctum*) leaf powder on growth performance in commercial broiler

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ABSTRACT: The present study aimed to explore the effect of supplementation of tulsi leaf powder on growth performance in commercial broilers. A total of 160, day-old chicks (Ven-Cobb-430Y strain) were used for this study purpose and divided into four groups (Control, T1, T2 and T3), and each group was divided into four replications with 10 chicks in each replicate. The control was offered a basal diet without any supplementation, whereas the T1, T2, and T3 groups were offered basal diet supplemented with dried tulsi leaf powder at 5.0, 10.0, and 15 g/kg feed, respectively for the 42 days of the study period. Body weight, weight gain, and feed consumption were recorded. We conclude that supplementation of dried tulsi leaf powder at 5g/kg feed in the broilers diets shows higher body weight, body weight gain, and improves feed conversion ratio compared to other treatment groups.

Key words: Broiler, feed, growth, tulsi leaf powder

Poultry farming is a type of animal husbandry in which domesticated birds are raised for producing meat or eggs for human use. Poultry is the most efficient converter of low value food into high-value nutritional food and its meat is a good source of protein, minerals, and vitamins, and it can help to meet the protein needs of India's rising population. India is the world's third-largest egg producer, followed by China and the United States and the fourth-largest chicken producer, next to China, Brazil and the United States of America (Singh, 2020). The present per-capita availability of eggs is 54, while chicken meat consumption is 2.2 kg, whereas the ICMR recommendation is the consumption of 180 eggs and 10.8 kg poultry meat per person per annum (ICAR- Directorate of Poultry Research, Vision 2050). Improved poultry breeds account for 59% of the overall bird population and 89% of total egg production in the country (Vetrivel and Chandrakumar, 2012). In 2019, India's total poultry population is 851.81 million, which is increased by 16.8% over previous census. Global egg production has risen by 150 % in the last three decades. The total number of backyard poultry is 317.07 million, which is increased by 45.8% and the total number of commercial chickens is 534.74 million, which is increased by 4.5% over the previous Census (GOI, 20th livestock census). In developing nations, nearly 80% of rural households raise poultry (FAO, 2021).

Antibiotics removal has led to poultry performance problems, feed conversion increases and a rise in the incidence of certain animal diseases, such as (subclinical) necrotic enteritis (Dibner and Richards, 2005). The main objective of adding feed additives is to boost animal performance by increasing their growth rate, better-feed conversion efficiency, greater livability and lowered mortality in poultry birds. Tulsi has attracted worldwide attention due to its vast range of medicinal properties without showing any adverse effects. Tulsi also promotes growth and feed efficiency of birds because of their

antibacterial properties (WHO, 1997). Tulsi contains eugenol, a phenolic compound and ursolic acid having pharmacological effects (Prakash and Gupta, 2005). The plant 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.*, 2012) and diaphoretic actions (Mondal *et al.*, 2009).

MATERIALS AND METHODS

This experiment was conducted at the Poultry Research and Training Centre, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (Uttar Pradesh). One hundred and sixty, day-old chicks of Ven-Cobb-430Y synthetic strain were purchased. All chicks were weighed for observing body weight and kept at brooding room for one week. After one week, all the chicks were individually weighed and randomly divided into four groups (Control, T1, T2 and T3) of 40 chicks each having similar average body weight. Each group was further subdivided into four replicates with 10 chicks in each replicate. The ISO certified basal feed in the form of broiler starter and broiler finisher was procured from the market as per the requirement. The birds were offered starter (0-2 weeks) and finisher (3-6 weeks) diet fed ad libitum. The chicks fed with the basal diet were maintained as control group. The treatment group diet T1 supplemented with dry tulsi leaf powder @ 5 g/kg feed, T2 supplemented with dry tulsi leaf powder @ 10 g/kg feed and T3 supplemented with dry tulsi leaf powder @ 15 g/kg feed. On day 1, jaggery juice was given to birds and from 2nd day fresh and clean drinking water was provided daily in the morning and evening to the birds throughout the experimental period. The treatment group diet T1 supplemented with dry tulsi leaf powder @ 5 g/kg feed, T2 supplemented with dry tulsi leaf powder @ 10 g/kg feed and T3 supplemented with dry tulsi leaf powder @ 15 g/kg feed. The body weight, weight gain and feed consumption are the measured parameters.

Statistical analysis

Data obtained was subjected to statistical analysis using completely randomized design with the simple analysis of variance technique (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION

Body weight

The average body weight of chicks in the control group was weighed 44.38g and T1, T2 and T3 groups were weighed 45.25g, 44.95g and 45.08g, respectively, are presented in Table 1. Statistical analysis showed that the body weight differences between the groups were found to be non-significant ($P<0.05$) at day-old age. The average body weight of three-week-old Ven-Cobb-430Y broiler chicks of all the treatment groups are presented in Table 2. The average body weight of three-week-old chicks were recorded for the Control, T1, T2 and T3 groups which weighed 633.50g, 670.50g, 669.13g and 669.75g respectively. The average body weight of six-week-old Ven-Cobb-430Y broiler birds of all the treatment groups are presented in table 3. The body weight of Ven-Cobb-430Y broiler birds ranged from 1752.50g (control) to 1900.75g (T1). Statistical analysis showed that the average body weight in the T1 group was significantly ($P<0.05$) higher than the control, T2 and T3 groups. Body weight was significantly improved in tulsi leaf powder supplemented groups as compared to control group. These findings were agreeing with the findings of Lanjewar *et al.* (2008) reported live body weight increased significantly ($P<0.01$) with the supplementation of Tulsi Leaf Powder. Hasan *et al.* (2016) reported that Tulsi leaf extract supplementation group has significantly (at 1% level) increased live body weight than that of the control group. Islam *et al.* (2021), Shende *et al.* (2021) also reported higher body weight in chicks fed a diet containing dried TLP. Similar to present findings, Abbas (2010) reported higher BW in chicks supplemented with dried TLP at the rate of 3 g/kg feed over a 42 days experimental period.

Table 1: Body weight (g) of Ven-Cobb-430Y broiler chicks at day-old

Treatments	Number of replications				Mean	SEM
	R1	R2	R3	R4		
Control	45.00	44.40	44.10	44.00	44.38[a]	0.23
T1	45.50	46.50	45.00	44.00	45.25[a]	0.52
T2	44.80	45.00	46.00	44.00	44.95[a]	0.41
T3	45.00	46.00	44.00	45.30	45.08[a]	0.42
				Overall mean	44.91	0.39

* (n=10 chicks) a, b, c: Means with different superscripts in each column Differ significantly (P<0.05).
* T1= TLP @ 5g/kg feed, T2= TLP @ 10g/kg feed, T3= TLP @ 15 g/kg feed.

Table 2: Effect of TLP supplementation on body weight (g) of Ven-Cobb-430Y broiler at 3rd week

Treatments	Number of replications				Mean	SEM
	R1	R2	R3	R4		
Control	637.00	636.00	631.00	630.00	633.50[a]	1.76
T1	671.00	678.00	663.00	670.00	670.50[b]	3.07
T2	682.00	679.50	659.00	656.00	669.13[b]	6.76
T3	685.00	659.00	660.00	675.00	669.75[b]	6.26
				Overall mean	660.72	4.46

* (n=10 chicks) a, b, c: Means with different superscripts in each column Differ significantly (P<0.05).
* T1= TLP @ 5g/kg feed, T2= TLP @ 10g/kg feed, T3= TLP @ 15 g/kg feed.

Table 3: Effect of TLP supplementation on body weight (g) of Ven-Cobb-430Y broiler at 6th week

Treatments	Number of replications				Mean	SEM
	R1	R2	R3	R4		
Control	1740.00	1762.00	1749.00	1759.00	1752.50[a]	5.01
T1	1909.00	1901.00	1890.00	1903.00	1900.75[b]	3.97
T2	1852.00	1850.00	1840.00	1848.00	1847.50[ab]	2.63
T3	1806.00	1811.00	1796.00	1790.00	1800.75[ab]	4.75
				Overall mean	1825.38	4.09

* (n=10 chicks) a, b, c: Means with different superscripts in each column Differ significantly (P<0.05).
* T1= TLP @ 5g/kg feed, T2= TLP @ 10g/kg feed, T3= TLP @ 15 g/kg feed

Body Weight Gain

The body weight gain during 0-1 week of age in Ven-Cobb-430Y broiler chicks of all the treatment groups are presented in Table 4. The body weight gain during 0-1 week of age were recorded for the Control, T1, T2 and T3 groups which weighed 119.63g, 126.50g, 127.68g and 126.05g, respectively. The body weight gain during 3-4 week of age in Ven-Cobb-430Y broiler birds of all the treatment groups are presented in Table 5. The body weight gain during 3-4 week of age were recorded for the Control, T1, T2 and T3 groups which weighed 352.00g, 378.25g, 369.00g and 352.00g respectively. The body weight gains up to 6 weeks of age in Ven-Cobb-430Y broiler birds of all the treatment groups are presented in table 6. The body weight gains up to 6 weeks of age were recorded for the Control, T1, T2 and T3 groups which weighed 1708.13g, 1909.13g, 1831.00g and 1802.75g respectively. The average body weight in the control group was significantly (P<0.05) lower than the T1 and T2 groups and did not show any significant (P<0.05) difference with the T3 group. In the present study, body weight gain was improved in broiler chicks receiving treatment diets as compared to the control group birds. These findings are agreeing with the Gupta and Charan (2007) where they reported maximum weight gain was observed in group of chickens treated with 200 mg of dried leaves powder as compared to control group. Lanjewar *et al.* (2008) also reported that weekly body weight increased

significantly (P<0.01) with the supplementation of TLP. Similar to these findings, Sheoran *et al.* (2017) also reported that mean body weight gain was improved (P<0.05) in broilers fed with holy basil leaf powder incorporated diets compared with the control group.

Feed Consumption

The feed consumption during 3-4 week of age in Ven-Cobb-430Y broiler birds of all the treatment groups are presented in Table 7. The feed consumption during 3-4 week of age were recorded for the Control, T1, T2 and T3 groups which weighed 636.18g, 640.00g, 637.23g and 638.58g respectively. The feed consumption up to 6 weeks of age in Ven-Cobb-430Y broiler birds of all the treatment groups are presented in table 8. The feed consumption up to 6 weeks of age were recorded for the Control, T1, T2 and T3 groups which weighed 3306.40g, 3368.43g, 3330.43g and 3317.78g respectively. The feed consumption, higher up to 6 weeks of broiler birds of all the treatment groups differ significantly (P<0.05) to each other. These findings are in agreeing with the Pandian *et al.* (2013), who reported feed consumption between treatments and control groups differ significantly (Pd"0.01). In contrast to present findings, Onwurah *et al.* (2011) reported feed intake was not significantly (P>0.05) different between groups.

Table 4: Effect of TLP supplementation on body weight gain (g) of Ven-Cobb-430Y broiler chicks during 0-1 week of age

Treatments	Number of replications				Mean	SEM
	R1	R2	R3	R4		
Control	120.00	119.60	118.90	120.00	119.63[a]	0.26
T1	126.50	128.50	126.00	125.00	126.50[b]	0.74
T2	126.20	129.50	128.00	127.00	127.68[b]	0.71
T3	126.00	124.00	127.00	127.20	126.05[b]	0.73
				Overall mean	124.96	0.61

* (n=10 chicks) a, b, c: Means with different superscripts in each column Differ significantly (P<0.05).
* T1= TLP @ 5g/kg feed, T2= TLP @ 10g/kg feed, T3= TLP @ 15 g/kg feed

Table 5: Effect of TLP supplementation on body weight gain (g) of Ven-Cobb-430Y broiler birds during 3-4 week of age

Treatments	Number of replications				Mean	SEM
	R1	R2	R3	R4		
Control	348.00	353.00	350.00	357.00	352.00[a]	1.96
T1	378.00	374.00	382.00	379.00	378.25[b]	1.65
T2	363.00	370.00	371.00	372.00	369.00[b]	2.04
T3	342.00	359.00	361.00	346.00	352.00[a]	4.71
				Overall mean	362.81	2.59

* (n=10 chicks) a, b, c: Means with different superscripts in each column Differ significantly (P<0.05).
* T1= TLP @ 5g/kg feed, T2= TLP @ 10g/kg feed, T3= TLP @ 15 g/kg feed

Table 6: Effect of TLP supplementation on body weight gain (g) of Ven-Cobb-430Y broiler birds up to 6 weeks of age

Treatments	Number of replications				Mean	SEM
	R1	R2	R3	R4		
Control	1695.00	1717.60	1704.90	1715.00	1708.13[a]	5.16
T1	1899.00	1896.50	1909.00	1932.00	1909.13[c]	8.09
T2	1783.00	1845.00	1850.00	1846.00	1831.00[bc]	16.04
T3	1796.00	1805.00	1799.00	1811.00	1802.75[ab]	3.33
				Overall mean	1812.75	8.15

* (n=10 chicks) a, b, c: Means with different superscripts in each column Differ significantly (P<0.05).
* T1= TLP @ 5g/kg feed, T2= TLP @ 10g/kg feed, T3= TLP @ 15 g/kg feed

Feed Conversion Ratio

The feed conversion ratio of Ven-Cobb-430Y broiler birds from all the four different treatment groups are calculated at the end of 6th week and it was presented in Tables 9. The Feed conversion ratios were recorded for The Control, T1, T2 and T3 groups which weighed 1.94, 1.78, 1.83 and 1.85 respectively. The feed conversion ratio of the T1, T2 and T3 groups was significantly ($P<0.05$) increased than control group, whereas, The T1, T2 and T3 groups did not show any significance ($P<0.05$) difference with each other. In the present study, feed consumption ratio improved significantly ($P<0.05$) in tulsi leaf powder supplemented groups than the control group. These findings are similar with the results of Prajapat *et al.* (2018) where they found lower FCR in Tulsi supplemented groups as compared to control groups. Hossain *et al.* (2021) found that the feed conversion ratio (FCR) of treatment group B was (1.88) better than the control group (2.15).

CONCLUSION

We conclude that supplementation of dried Tulsi leaf powder at an inclusion rate of 5g/kg feed in the broilers' diets had significant effect on body weight, body weight gain, feed consumption and feed conversation ratio of commercial broiler hence the

Table 7: Effect of TLP supplementation on Feed consumption (g) of Ven-Cobb-430Y broiler birds during 3-4 week of age

Treatments	Number of replications				Mean	SEM
	R1	R2	R3	R4		
Control	635.20	635.50	636.50	637.50	636.18[a]	0.52
T1	641.50	640.50	638.50	639.50	640.00[c]	0.65
T2	638.50	637.50	635.50	637.40	637.23[ab]	0.63
T3	639.10	639.50	638.20	637.50	638.58[bc]	0.45
				Overall mean	637.99	0.56

* (n=10 chicks) a, b, c: Means with different superscripts in each column Differ significantly ($P<0.05$).
* T1= TLP @ 5g/kg feed, T2= TLP @ 10g/kg feed, T3= TLP @ 15 g/kg feed

Table 8: Effect of TLP supplementation on Feed consumption (g) of Ven-Cobb-430Y broiler birds up to 6 weeks of age

Treatments	Number of replications				Mean	SEM
	R1	R2	R3	R4		
Control	3302.30	3305.50	3307.50	3310.30	3306.40[a]	2.03
T1	3378.50	3369.40	3360.80	3365.00	3368.43[d]	3.79
T2	3336.20	3331.10	3324.50	3329.90	3330.43[c]	2.40
T3	3320.00	3323.10	3315.40	3312.60	3317.78[b]	2.34
				Overall mean	3330.83	2.64

* (n=10 chicks) a, b, c: Means with different superscripts in each column Differ significantly ($P<0.05$).
* T1= TLP @ 5g/kg feed, T2= TLP @ 10g/kg feed, T3= TLP @ 15 g/kg feed

Table 9: Effect of TLP supplementation on Feed consumption ratio of Ven-Cobb-430Y broiler birds at the end of 6 weeks of age

Treatments	Number of replications				Mean	SEM
	R1	R2	R3	R4		
Control	1.95	1.93	1.95	1.94	1.94[b]	0.00
T1	1.79	1.79	1.77	1.76	1.78[a]	0.01
T2	1.88	1.82	1.81	1.82	1.83[a]	0.02
T3	1.87	1.85	1.85	1.84	1.85[a]	0.01
				Overall mean	1.85	0.01

* (n=10 chicks) a, b, c: Means with different superscripts in each column Differ significantly ($P<0.05$).
* T1= TLP @ 5g/kg feed, T2= TLP @ 10g/kg feed, T3= TLP @ 15 g/kg feed

inclusion of tulsi leaf powder at the rate of 5g/kg feed proves beneficial and economical for the poultry farmers.

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