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Performance of broiler chicken fed *tulsi* leaf powder and leaf extract supplemented diets during summer to alleviate heat stress

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Tulsi, queen of herbs, is one of the holiest and most cherished herbs in India. 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). The main constituents responsible for these properties are eugenol, ascorbic acid, ß-carotene, ß-sitosterol, palmitic acid and tannins (Gupta *et al.* 2006, Choudhury *et al*. 2010). An experiment was conducted to evaluate the effect of dietary supplementation of *tulsi* (*Ocimum sanctum*) leaf powder and commercial grade leaf extract on alleviation of heat stress in commercial broilers during summer.

Day-old broiler chicks (90) of either sex were randomly divided into 3 groups of 10 each with 3 replicates. Control group (T_1) was offered basal diet and the treatment groups T_2 and T_3 were supplemented with *tulsi* leaf powder (0.5%) and *tulsi* leaf extract (0.1%) in maize – soybean meal based diets, respectively. All the birds were reared under standard managemental conditions up to 6 weeks of age during summer (April – May 2012). Birds were vaccinated against ND and IBD at the age of 7th and 14th day respectively. Weekly feed consumption and body weight of birds were recorded. Feed conversion efficiency (FCR) was calculated. At the end of the experimental period of 42 days, 2 birds from each replicate were slaughtered and parameters such as hot carcass, liver weight and intestinal length were measured. Levels of ascorbic acid and glutathione peroxidase activity in serum samples were assayed (Sivakumar *et al*. 2012). ELISA technique was used to measure antibody titre against Ranikhet disease. The data were subjected to analysis of variance test. Means of different groups were compared using Duncan's multiple range tests using SPSS software (Version 20.0).

The performance of broilers fed *tulsi* leaf powder and extract based diets is presented in Table 1.

The body weight (g) of T_3 group fed *tulsi* extract @ 0.1% was numerically higher when compared to the control group. The feed intake (g) was significantly ($P<0.05$) more in T_3 (4,558.99±74.97) group as compared to T_1 (3,954.22±83.24).

Table 1. Feed intake, body weight, feed conversion efficiency, feed cost, carcass characteristics, serum glutathione peroxidase, ascorbic acid and blood RD titre levels in broilers fed *tulsi* powder (0.5%) and *tulsi* extract (0.1%) supplemented diets

Treatment	Control (T1)	*Tulsi* powder (0.5%) – T2	*Tulsi* extract (0.1%) – T3
Feed intake (g) (n=3)	3954.22^{a}± 83.24	4299.14^{ab}± 36.89	4558.99^{b}±74.97
Body weight (g) (n=30)	1947.83±41.39	2113.66±65.07	2153.05±69.59
FCR (n=3)	2.03±0.06	2.02±0.06	1.94±0.08
Feed cost (in ₹) per kg body weight	57.34±0.78	58.59±1.91	65.03±4.11
Hot carcass weight (g) (n=6)	1537.50±33.26	1725.25±48.88	1772.25±47.74
Dressing percentage (n=6)	78.44±1.60	77.16±1.52	77.00 ±0.59
Liver weight (as % body weight) (n=6)	2.69±0.27	2.43±0.17	2.51±0.13
Intestinal length (cm) (n=6)	183.75±6.77	188.00±9.68	216.50±16.29
Ascorbic acid (mg/ml) (n=6)	0.94^{a}±0.3	1.98^{b}±0.8	0.99^{a}±0.1
Glutathione peroxidase (mg/ml) (n=6)	32.84^{b}±4.65	19.86^{a}± 3.73	38.31^{b}± 2.97
RD titre value (log_2) (n=6)	6.6	7.66	7.0

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Similar observations were reported by Gupta and Charan (2007) and Batra and Gupta (2004) in broilers. The feed conversion efficiency did not differ significantly. The feed cost per unit weight gain was more in *tulsi* extract supplemented groups. The hot carcass weight, liver weight, dressing percentage between the groups did not differ significantly. However, intestinal length (cm) was relatively more in T_3 (216.50±16.29) group when compared to the T_1 (183.75±6.77) and T_2 (188.00±9.68) groups. Reports on effect of *tulsi* on carcass traits of broiler chicken are scanty. Dietary supplementation of *tulsi* extract (0.1%) significantly increased the glutathione peroxidase activity and *tulsi* powder (0.5%) significantly increased the ascorbic acid level in the serum. This observation on antioxidant enzymes in serum supports the findings of Reddy *et al*. (2009), who reported that *Ocimum sanctum* can combat oxidative stress in broilers thereby increasing the anti - oxidative enzyme levels. The immune status of birds as assessed by RD titre value was better in T_2 ($\log_2$ 7.66) as compared to control group ($\log_2$ 6.66). Our results are in accordance with earlier reports of Manjunatha (2002) and Kumar *et al*. (2012) who observed the immunomodulating property of *Ocimum sanctum*.

From this study, it could be concluded that supplementation of *tulsi* powder (0.5%) and commercial grade *tulsi* extract (0.1%) in the diet enhances the overall performance, antioxidant status and immunity in commercial broiler chickens during summer. However, further studies using different levels of *tulsi* in the ration are required.

SUMMARY

A broiler trial was conducted using 90 broilers up to 42 days of age to evaluate effect of dietary supplementation of *tulsi (Ocimum sanctum)* leaf powder and commercial grade leaf extract on alleviation of heat stress during summer. Control group (T_1) was offered basal diet and treatment groups T_2 and T_3 were supplemented with *tulsi* leaf powder (0.5%) and *tulsi* leaf extract (0.1%), respectively. The feed intake in T_3 group was higher as compared to T_1 group. The body weight, feed conversion efficiency, hot carcass weight and liver weight did not differ significantly between groups. Intestinal length was comparatively more in *tulsi* extract supplemented group. Dietary supplementation of *tulsi* extract (0.1%) increased glutathione peroxidase activity and *tulsi* powder (0.5%) increased ascorbic acid levels in serum. The RD titre value was better in T_2 ($\log_2$ 7.66) group. Supplementation of *tulsi* powder (0.5%) and commercial grade *tulsi* extract (0.1%) in the diet during summer enhanced the overall performance, antioxidant status and immunity in commercial broiler chickens.

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