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Effect of supplementation of Tulsi (*Ocimum sanctum*) leaf powder (at graded levels) or Vitamin E either alone or in combinations on tibial bone characteristic of broiler chickens

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Abstract

The present study was carried out to investigate the effect of Tulsi (*Ocimum sanctum*) leaf powder (at graded levels) or Vitamin E alone and in combinations using 360 one day old broiler chicks in experiment within a completely randomized design and divided into ten dietary treatments groups (T₁-T₁₀) in triplicate of 12 chicks per replicate. Diets included: T₁-basal diet with no supplementation; T₂-basal diet supplemented with 0.25% Tulsi leaf powder; T₃-basal diet supplemented with 0.50% Tulsi leaf powder; T₄-basal diet supplemented with 0.75% Tulsi leaf powder; T₅-basal diet supplemented with 1.0% Tulsi leaf powder; T₆-basal diet supplemented with 0.025% Vitamin E; T₇-basal diet supplemented with 0.25% Tulsi leaf powder plus 0.025% Vitamin E; T₈-basal diet supplemented with 0.50% Tulsi leaf powder plus 0.025% Vitamin E; T₉-basal diet supplemented with 0.75% Tulsi leaf powder plus 0.025% Vitamin E and T₁₀-basal diet supplemented with 1.0% Tulsi leaf powder plus 0.025% Vitamin E. A 42 day feeding trial was carried out from Jan., 2021 to Feb., 2021 at the Experimental Poultry Unit, located in poultry farm of College of Veterinary and Animal Science, Bikaner. The feed was offered as per BIS, 2007 standards. The average temperature range (18.00 °C to 20.57 °C) during the study period was in normothermia zone i.e. 22-28 °C or 18-24 °C established for poultry, which indicated that birds were in comfort zone. Present study showed non-significant increase in tibia weight and tibia measurements in control group as compared to various treatment groups.

Keywords: Tulsi *Ocimum sanctum* leaf powder, Vitamin E, tibia bone, tibia ash

Introduction

Nowadays, rapid growth rate is desirable in poultry with little attention to the effects on bone characteristics of broilers (Lohakare, 2005) [13]. Due to chronic heat stress, the metabolic oxidation capacity of skeletal muscle is stimulated through the increasing levels of corticosterone and catecholamines, which causes lipid peroxidation in cell membranes (Sahin *et al.*, 2001; Mujahid *et al.*, 2007) [21, 16]. Further, it causes bone problems (Rath *et al.*, 2000) in broiler chickens and may suffer lameness in arid region. Vitamin 'E' is the major lipid soluble antioxidant present in the cell membrane and play an important role as a chain-breaking lipid antioxidant and free radical scavenger in the membranes of cell and sub cellular organs. Vitamin E is the first line of defense against cellular damage that results from membrane phospholipid peroxidation. Vitamin E is essential for formation and maintenance of cartilage, connective tissue and bone. In the past few decades, herbs have been used as an antioxidant by stimulating antioxidative enzymatic systems (Sujatha *et al.*, 2010). Scanty literature is available regarding the influence of herbs on bone characteristic. Tulsi has been traditionally used as either a fresh or dried spice, possess highest Selenium content as reported by Ozkutlu *et al.* (2011). Further, Vitamin E and Selenium are essential nutrients that have complementary biological functions as antioxidants to minimize cellular damage caused by endogenous peroxides. The endogenous peroxides are mainly responsible for cellular degeneration and necrosis.

Adequate and appropriate nutritional strategy is required for optimal broiler production, which can reduce the negative effects of stress to the minimum. Therefore, this study was planned to investigate the effect of Tulsi (*Ocimum sanctum*) leaf powder (at graded levels) or Vitamin E supplementation alone and in combinations on bone characteristics of broiler chickens during experimental study.

Material and Methods

A 42 days feeding trial was carried out from Jan., 2021 to Feb., 2021 at the Experimental Poultry Unit, located in poultry farm of College of Veterinary and Animal Science, Bikaner. The 360 experimental day old broiler chicks were equally and randomly divided into ten dietary treatments groups (T₁-T₁₀) and each dietary group was replicated to three sub-groups (R₁-R₃) to make sure uniformly in various treatment groups. Diets included: T₁-basal diet with no supplementation; T₂-basal diet supplemented with 0.25% Tulsi leaf powder; T₃-basal diet supplemented with 0.50% Tulsi leaf powder; T₄-basal diet supplemented with 0.75% Tulsi leaf powder; T₅-basal diet supplemented with 1.0% Tulsi leaf powder; T₆-basal diet supplemented with 0.025% Vitamin E; T₇-basal diet supplemented with 0.25% Tulsi leaf powder plus 0.025% Vitamin E; T₈-basal diet supplemented with 0.50% Tulsi leaf powder plus 0.025% Vitamin E; T₉-basal diet supplemented with 0.75% Tulsi leaf powder plus 0.025% Vitamin E and T₁₀-basal diet supplemented with 1.0% Tulsi leaf powder plus 0.025% Vitamin E. Good quality of Tulsi (*Ocimum sanctum*) leaf powder was procured from reputed firm of Bikaner (Rajasthan). The commercially available Vitamin E (99.99% pure), was used. The broiler starter and finisher feed contained 22.12% and 20.22% crude protein, respectively. Broilers were maintained under standard managemental practices regarding brooding, feeding, watering and disease control throughout the trial period.

The left tibial bones of slaughtered birds were collected and their adhering muscles together with connective tissues were thoroughly removed manually as well as by dipping in boiling water for 5 minutes. Width of the mid shaft and each epiphysis (proximal and distal width) as well as the total length of the tibia bone were measured with vernier caliper. Each tibia was defatted for 16 hrs in petroleum spirit (Boiling point 60-80 °C) using Soxhlet apparatus, dried and weighed before ashing. The total ash was determined as per AOAC (2005) [1]. The data obtained in the experiment were analysed statistically to access the effect of Tulsi (*Ocimum sanctum*) leaf powder and Vitamin E as per Snedecor and Cochran (2004) [22] and significance of mean differences was tested by Duncan's New Multiple Range Test (DNMRT) as modified by Kramer (1957).

Results and Discussion

The calculated THI for different weeks was obtained to be in range from 64.29 to 68.15; a value normal the THI threshold of 70, established for poultry (Bouraoui *et al.*, 2002; Karaman *et al.*, 2007) [2, 9]. The average temperature range (18.00 °C to 20.57 °C) during the study period was in normothermia zone *i.e.* 22-28 °C (Donkoh, 1989) [5] or 18-24 °C (Holik, 2009) [7]

established for poultry in the tropical regions, which indicated that birds were in comfort zone. The data of tibia weight, tibia measurements and tibia ash percent of broilers subjected to various treatments *i.e.* supplementation of Tulsi (*Ocimum sanctum*) leaf powder (at graded levels) or Vitamin E alone and various combinations of both have been presented in Table 1 and Fig. 1. The statistical analysis of data of tibia weight and tibia measurements *i.e.* total tibia length, proximal end width, mid shaft width and distal end width revealed non-significant effect on supplementation of Tulsi (*Ocimum sanctum*) leaf powder (at graded levels) or Vitamin E alone and their various combinations.

The obtained results of tibia weight, tibia length tibia width, tibia ash were not affected by Tulsi leaf powder and Vitamin E supplementation are in line with findings of Jain (2018) [8] who reported non-significant effect of geloi supplementation on tibia weight, tibia length tibia width, tibia ash. Hafeez *et al.* (2020) [6] also observed non-significant on tibia bone quality parameters by ajwain, fenugreek and black cumin supplementation. On contrary, Rehman *et al.* (2018) [19], reported significant increase in tibia bone weight and tibia ash percentage by *Moringa oleifera* leaf powder incorporation in broilers diet.

The hot rearing temperature influenced tibial bone characteristics of the broiler chickens though it was non-significant. These birds presented lower tibia weight and tibia measurements *i.e.* total tibia length, proximal end width, mid shaft width and distal end width. These obtained results are consistent with the findings of Bruno *et al.* (2000) [3], who reported that broiler chickens reared under heat stress conditions showed a decrease in tibia length and width. The obtained results of tibia weight, tibia length and tibia width were not affected by ascorbic acid supplementation which are in line with findings of Konca *et al.* (2009) [10]. Further, present findings also gain support with findings of Roberson and Edwards (1994) [20], McCormack *et al.* (2001) and Ogunwole (2015) [17] who reported ascorbic acid supplementation did not affect bone properties in broilers. The findings of significant increase of tibia ash due to effect of ascorbic acid are in accordance with the results of Lohakare *et al.* (2005) [13] who reported significant increase in bone ash in ascorbic acid (@200 ppm) supplemented group. The findings also get support with the findings of Ogunwole, (2015) [17] on inclusion of ascorbic acid @ 0.30%. Vitamin D is converted into its metabolic active form calcitrol under the influence of vitamin C, which is essential for calcium and phosphorus regulation and calcification process (Lohakare *et al.*, 2005) [13]. The positive effects of ascorbic acid on tibia ash are probably due to its impact on reducing the effects of heat stress.

Table 1: Effect of supplementation of Tulsi at graded levels and Vitamin E alone or in combination on tibia bone evaluation in broilers

Treatment groups	Tibia weight (g)	Tibia length (mm)	Proximal end width (mm)	Mid-shaft width (mm)	Distal end width (mm)	Tibia ash (%)
T ₁	5.05	95.04	23.45	8.41	18.14	39.72
T ₂	5.23	95.56	23.71	8.61	18.41	41.23
T ₃	5.25	95.75	23.80	8.68	18.49	41.64
T ₄	5.22	95.50	23.66	8.48	18.35	41.13
T ₅	5.06	95.32	23.50	8.43	18.30	40.03
T ₆	5.24	95.66	23.75	8.63	18.47	41.36
T ₇	5.23	95.55	23.71	8.59	18.40	41.17
T ₈	5.27	96.43	23.98	8.78	18.58	41.81
T ₉	5.21	95.35	23.61	8.47	18.32	40.09

T ₁₀	5.18	95.33	23.59	8.46	18.30	41.04
SEM	0.0684	0.4131	0.2075	0.1279	0.1295	1.0801

Conclusion

Broilers reared during experimental period presented lower tibia weight and measurement as well as tibia ash in control group as compared to various treatment groups. No significant ($P>0.05$) effect was observed due to Tulsi and Vitamin E supplementation on tibia ash.

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