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## ORIGINAL ARTICLE

# The Effects of Different Levels of *Tribulus terrestrist* Extract on the Performance and Carcass Characteristics of Broiler Chickens

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**ABSTRACT**
*The present study was conducted to investigate the effects of different levels of Tribulus Terrestrist (TT) extract on the performance and carcass characteristics of broiler chickens. A total of 210, one-day-old chickens were randomly allotted to 5 dietary treatments with 3 replicates of 14 chickens and fed with basal diet including 0, 60, 120, 180 ppm of TT and 10 ppm of Testesrone Enanthate. Growth performance (evaluated through weight gain, feed intake and food efficiency) was determined on day 10, 24 and 42. Carcass characteristics (relative weights of carcass, breast, legs, liver, heart, gizzard, abdominal fat and intestine) were assessed on day 42. As a conclusion, dietary different levels of TT extract hadn't any significant effect on feed intake through the whole experimental period, whereas body weight gains and feed conversion ratio for periods of11-24,25-42 and 1-42 days were significantly altered (p<0.05). Carcass weight of male broilers was significantly increased, but other carcass characteristics were not significantly altered .The results this study showed that, dietary 180 ppm TT extract the greatest effect in improving performance and carcass weight of broiler chickens.*
***Keywords:*** *broiler, carcass, performance, tribulus terrestrist*

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## INTRODUCTION

Antibiotics have been used worldwide at subtherapeutic doses in poultry industry to bird's growth, feed conversion efficiency, and inhibition of pathogen growth[1, 2]. Antibiotic growth promoters were supposed to increase growth rate as a result of improved gut health, resulting in better nutrient utilization and consequently decreasing feed conversion ratio[3]. However, there is a great fear of using antibiotics as feed additives because of public concern about antibiotic residues in poultry products and the risk of increasing the level of bacteria resistant to antibiotics [4, 5]. As a result, prebiotics, phytogenic and herbal products have received increased attention as possible antibiotic growth promoter substitutions. Also, recent research on herbal products as feed additives have shown encouraging results in relation to development of the gastrointestinal tract, body weight gain, feed efficiency, increased carcass yield and lower mortality in the absence of antibiotic growth [6, 7, 8, 9, 10].Moreover, Aromatic plants and herbal products have received increased attention in recent years because they have been accepted by consumers as natural additives [11].

*Tribulus terrestris* (TT) is considered as an annual herb that is widely distributed in Iran, Turkey, Japan, China, Korea, the south part of Europe, the western part of Asia and Africa [12, 2]. This plant contains saponins [13, 14], alkaloids [15], flavonoids [12], phytosteroids, glycosides [16], resin [17], peroxidase, diastase, carbonhydrate [18], protein, sucrose, fructose [19]. Although saponins [20, 21] are the main components of TT, only protodioscin, methylprotodioscin, methylprototribestin and prototribestin have been isolated and identified so far [22]. Protodioscin has been known as the most dominant saponin in

TT, also is the main substance responsible for enhancing testosterone hormone [18] and its derivatives [23, 24].In this way that, the active agent in TT is believed to be protodioscin. Protodioscin is a precursor to dehydroepiandrosterone (DHEA). As you may know, DHEA and androstenedione are precursors to testosterone [25]. Therefore, Using of TT causes increase testestrone levels and consequently improve muscle [23, 26, 27]. Theoretically, increasing testosterone hormone availability may promote greater gains in strength and muscle mass and consequently increasing production performance in broilers.
On the whole, little research has been conducted on the use of TT extract in broilers diet. Thus, this study was conducted to determine the effect of TT extract on the performance and carcass characteristics of broiler chickens.

## MATERIALS AND METHODS

*Birds, Experimental Design and Management*

A total of 210 broilers (Ross 308), one-day-old, were randomly assigned to five dietary treatments in a complete randomized design, each of which was replicated three times with 14 birds per replicate (7 male and 7 female). The following treatments were applied: 1) basal diet (Control), 2) basal diet 10 ppm Testesrone Enanthate, 3)basal diet 60 ppm TT extract, 4) basal diet 120 ppm TT extract, 5) basal diet 180 ppm TT extract.The diets were formulated to meet the requirements of broiler as recommended by the catalog of Ross 308 broilers (Table 1). Birds had access to feed and water *ad libitum*. All the procedures were approved by the institutional animal care and use committee of the Shabestar Agricultural University. Chickens were housed in an environmentally controlled room. Room temperature was maintained at 32°C during the first week and gradually reduced to 21°C by the end of the third week. Twenty-three hours of fluorescent lighting was provided per day throughout the experimental period.

**Table 1.** Composition of the basal diet (ingredient and nutrients) given to broiler chickens for 6 weeks

| ***Ingredient (%)*** | ***Starter 1 to 10 d*** | ***Grower 11 to 24 d*** | ***Finisher 25 to 42 d*** |
|---|---|---|---|
| Corn | 55.98 | 59.58 | 65.41 |
| Soybean meal | 32.6 | 31.35 | 25.93 |
| Corn gluten | 3.59 | 0 | 0 |
| Dicalcium phosphate | 2.21 | 1.94 | 1.8 |
| Calcium carbonate | 1.33 | 1.08 | 1.06 |
| Soybean oil | 2.72 | 4.66 | 4.39 |
| L-Threonine | 0.08 | 0.06 | 0.06 |
| DL-Methionine | 0.3 | 0.29 | 0.25 |
| L-Lysine | 0.33 | 0.19 | 0.18 |
| **Sodium bicarbonate** | 0.14 | 0.08 | 0.23 |
| Vitamin permix[a] | 0.25 | 0.25 | 0.25 |
| Mineral permix[b] | 0.25 | 0.25 | 0.25 |
| Salt | 0.22 | 0.27 | 0.19 |
| ***Nutrients (Calculated)*** | | | |
| ME, kcal/kg | 3024 | 3150 | 3200 |
| CP, % | 25.1 | 22.1 | 19.7 |
| Ca, % | 1 | 0.99 | 0.94 |
| Available phosphorous, % | 0.55 | 0.49 | 0.46 |
| Lys, % | 1.4 | 1.21 | 1.07 |
| Met, % | 0.69 | 0.64 | 0.55 |

[a]Vitamins mixture provide per 2.5 kilogram of diet: vitamin A,12000000 IU; vitamin B1, 4000 mg; vitamin B2, 6000 mg; vitamin B3, 18000 mg; vitamin B6, 3000 mg; vitamin B12, 15 mg; vitamin D3, 5000000 IU; vitamin E, 50000 IU; vitamin K3, 3000 mg; vitamin B9, 1500 mg; vitamin B5, 70000 mg; vitamin H2, 100 mg; choline chloride, 400000 mg.
[b]Mineral mixture provide per 2.5 kilogram of diet: Mn, 120000 mg; Zn, 100000 mg; Fe, 40000 mg; Cu, 20000 mg; I, 1000 mg; Se, 300 mg.

In each cage, total chicken body weight, chicken numbers and the weight of unconsumed and added feed were recorded on days 0, 10, 24 and 42. The mean body weight gains, feed consumption and feed conversion ratios were calculated for each cage (replicate) between 1 and 10, 11 and 24, 25 and 42 and 1 and 42 days. For each time period, the body weight gain was calculated and expressed as grams per bird. The food intake (g of food intake/bird) over the entire grow-out period was calculated by totalling food

 

consumption in each time interval between each bird sampling. Food conversion ratio (g of food intake /g of body weight gain) was calculated by dividing the total food intake by the total weight gain in each cage.

*Carcass Characteristics*

On day 42, six birds per experimental groups were randomly selected for organ weights. Birds were weighted and slaughtered by cervical dislocation; then the abdominal cavity was opened. The weight of carcass, breast, thigh, heart, gizzard, liver, abdominal fat and intestine were recorded and the corresponding percentages (% of live body weight) were calculated.

*Statistical Analysis*

All the data were subjected to ANOVA procedures for completely randomized designs using the general linear model (GLM) procedure of the SAS program [28]. When data were in the form of percentages they were transformed by arc sin square root. Differences between treatments were compared by the Duncan's multiple [29] range tests following ANOVA, and the values were considered statistically different at $p < 0.05$.

**RESULTS**

On the whole, there were no significant treatment effects on feed intake through the whole experimental period. The body weight gains ($p<0.0427$ for the grower period, $p<0.0494$ for the finisher period and $p<0.0094$ for the whole experimental period) and feed conversion ratio ($p< 0.0226$ for the grower period, $p<0.0112$ for the finisher period and $p<0.0030$ for the whole experimental period) significantly improvedwith chickens treated by TT extract 180 ppm compared to the other groups whereas body weight gains and feed conversion ratio in chickens treated by TT extract 60 and 120 ppm were not significantly altered(Table 2, 3 ,4 and 5).

Furthermore, as shown in table 6 and 7 addition of TT extract 180 in the diet of male broilers significantly increased the weight of carcass in comparison to the other groups whereas breast, thigh, heart, gizzard, liver, abdominal fat and intestine were not significantly altered in the males and females.Although the differences were not statistically significant, it was also noted that the relative weights of breast, thigh, liver and heart numerically increased in broilers fed with TT extract 180 ppm in comparison to control group.

**Table 2.** Effects of different levels of *Tribulus Terrestrist* extract on body weight gain (BWG), food intake (FI) and feed conversion ratio (FCR) of broilers to 1-10 day of age

| Diet | 1-10 day of age (g) | | |
|---|---|---|---|
| | BWG | FI | FCR |
| Basal diet (Control) | 191.97 | 251.13 | 1.30 |
| Basal diet 10 ppm TE[1] | 197.51 | 259.01 | 1.31 |
| Basal diet 60 ppm TT[2] extract | 195.02 | 254.68 | 1.30 |
| Basal diet 60 ppm TT extract | 193.80 | 258.54 | 1.33 |
| Basal diet 60 ppm TT extract | 203.98 | 256.94 | 1.25 |
| SEM | 3.58 | 4.48 | 0.03 |
| P-Value | 0.2284 | 0.7230 | 0.6200 |

TE[1]: Testesrone Enanthate, TT[2]: *Tribulus Terrestrist*

**Table 3.** Effects of different levels of *Tribulus Terrestrist* extracton body weight gain (BWG), food intake (FI) and feed conversion ratio (FCR) of broilers to 11-24 day of age

| Diet | 11-24 day of age (g) | | |
|---|---|---|---|
| | BWG | FI | FCR |
| Basal diet (Control) | 588.85[b] | 867.23 | 1.47[a] |
| Basal diet 10 ppm TE[1] | 606.11[ab] | 859.74 | 1.41[ab] |
| Basal diet 60 ppm TT[2] extract | 593.32[b] | 872.74 | 1.47[a] |
| Basal diet 60 ppm TT extract | 596.07[b] | 863.27 | 1.44[a] |
| Basal diet 60 ppm TT extract | 619.96[a] | 850.15 | 1.37[b] |
| SEM | 5.86 | 5.81 | 0.01 |
| P-Value | 0.0427 | 0.1511 | 0.0226 |

 

TE[1]: Testesrone Enanthate, TT[2]: *Tribulus Terrestrist*
[a–b] Averages in a column with different superscript letters are significantly different.

**Table 4.** Effects of different levels of *Tribulus Terrestrist* extracton body weight gain (BWG), food intake (FI) and feed conversion ratio (FCR) of broilers to 25-42 day of age

| Diet | 25-42 day of age (g) | | |
|---|---|---|---|
| | BWG | FI | FCR |
| Basal diet (Control) | 1601.00[b] | 3314.00 | 2.07[a] |
| Basal diet 10 ppm TE[1] | 1627.67[a] | 3300.00 | 2.02[bc] |
| Basal diet 60 ppm TT[2] extract | 1614.67[ab] | 3299.33 | 2.04[abc] |
| Basal diet 60 ppm TT extract | 1610.67[ab] | 3304.67 | 2.05[ab] |
| Basal diet 60 ppm TT extract | 1635.17[a] | 3294.67 | 2.01[c] |
| SEM | 7.28 | 9.72 | 0.008 |
| P-Value | 0.0494 | 0.6922 | 0.0112 |

TE[1]: Testesrone Enanthate, TT[2]: *Tribulus Terrestrist*
[a–b] Averages in a column with different superscript letters are significantly different.

**Table 5.** Effects of different levels of *Tribulus Terrestrist* extracton body weight gain (BWG), food intake (FI) and feed conversion ratio (FCR) of broilers to 1-42 day of age

| Diet | 1-42 day of age (g) | | |
|---|---|---|---|
| | BWG | FI | FCR |
| Basal diet (Control) | 2381.83[c] | 4432.37 | 1.86[a] |
| Basal diet 10 ppm TE[1] | 2431.29[ab] | 4418.76 | 1.81[bc] |
| Basal diet 60 ppm TT[2] extract | 2403.01[bc] | 4426.76 | 1.84[ab] |
| Basal diet 60 ppm TT extract | 2400.54[bc] | 4426.48 | 1.84[ab] |
| Basal diet 60 ppm TT extract | 2456.11[a] | 4401.76 | 1.79[c] |
| SEM | 11.80 | 11.08 | 0.009 |
| P-Value | 0.0094 | 0.3862 | 0.0030 |

TE[1]: Testesrone Enanthate, TT[2]: *Tribulus Terrestrist*
[a–b] Averages in a column with different superscript letters are significantly different.

**Table 6.** Effects of different levels of *Tribulus Terrestrist* extract on weight of carcass, breast, thigh, heart, gizzard, liver, abdominal fat and intestine of male broiler chickens when they were 42 days old (estimated based on percentage of live body weight).

| **Diet** | **Carcass (%)** | **Breast (%)** | **Thigh (%)** | **Liver (%)** | **Heart (%)** | **Gizzard (%)** | **Abdominal fat (%)** | **Intestine (%)** |
|---|---|---|---|---|---|---|---|---|
| **Basal diet (Control)** | 67.34[b] | 24.27 | 19.76 | 1.83 | 0.62 | 1.80 | 2.56 | 5.53 |
| **Basal diet 10 ppm TE[1]** | 68.07[ab] | 24.52 | 19.83 | 1.71 | 0.51 | 1.70 | 3.15 | 4.73 |
| **Basal diet 60 ppm TT[2] extract** | 67.59[b] | 24.07 | 20.38 | 2.05 | 0.62 | 1.98 | 2.57 | 5.56 |
| **Basal diet 60 ppm TT extract** | 67.87[b] | 23.39 | 20.34 | 2.08 | 0.63 | 2.12 | 2.54 | 4.74 |
| **Basal diet 60 ppm TT extract** | 69.03[a] | 25.60 | 20.77 | 2.09 | 0.76 | 2.11 | 3.08 | 5.57 |
| **SEM** | 0.34 | 0.64 | 0.38 | 0.14 | 0.05 | 0.14 | 0.24 | 0.26 |
| **P-Value** | 0.0485 | 0.2592 | 0.3657 | 0.2807 | 0.1133 | 0.2229 | 0.2487 | 0.0828 |

TE[1]: Testesrone Enanthate, TT[2]: *Tribulus Terrestrist*
[a–b] Averages in a column with different superscript letters are significantly different.

 

**Table 7.** Effects of different levels of *Tribulus Terrestrist* extract on weight of carcass, breast, thigh, heart, gizzard, liver, abdominal fat and intestine of female broiler chickens when they were 42 days old (estimated based on percentage of live body weight).

| Diet | Carcass (%) | Breast (%) | Thigh (%) | Liver (%) | Heart (%) | Gizzard (%) | Abdominal fat (%) | Intestine (%) |
|---|---|---|---|---|---|---|---|---|
| Basal diet (Control) | 67.26 | 23.56 | 19.42 | 1.80 | 0.63 | 1.77 | 2.42 | 5.47 |
| Basal diet 10 ppm TE[1] | 67.67 | 23.97 | 19.43 | 1.73 | 0.54 | 1.66 | 3.08 | 4.64 |
| Basal diet 60 ppm TT[2] extract | 67.91 | 23.76 | 20.12 | 2.07 | 0.59 | 1.95 | 2.61 | 5.48 |
| Basal diet 60 ppm TT extract | 67.87 | 23.14 | 20.12 | 2.17 | 0.63 | 2.01 | 2.50 | 4.68 |
| Basal diet 60 ppm TT extract | 68.76 | 26.57 | 20.32 | 1.91 | 0.74 | 2.08 | 3.01 | 5.57 |
| SEM | 0.73 | 0.82 | 0.36 | 0.16 | 0.05 | 0.13 | 0.24 | 0.34 |
| P-Value | 0.7022 | 0.0915 | 0.3053 | 0.3247 | 0.2262 | 0.2170 | 0.2657 | 0.1957 |

TE[1]: Testesrone Enanthate, TT[2]: *Tribulus Terrestrist*

## DISCUSSION

Results of the present study showed that growth performance of broilers improved with TT extract 180 ppm but broilers treated by TT extract 60 and 120 ppm were not significantly altered. In agreement, Fekri et al. [2] demonstrate that the supplementation of TT extract at the rate of 1 and 5 g/kg of basal diet did not result in significant differences in growth performance at 42 days of age for broilers.Duru and Sahin [30] reported that daily feed intake, daily body weight gain and feed conversion ratios of broiler chickens fed with TT extract were not significantly altered. These researchers stated thatthe reason of lack of effect of TT powder are 1) the chosen doses may be lower,2) the effective substances in TT powder had not been released to intestine, 3) the age of broiler chicks were quite young and consequently the testosterone production of testes might be near to zero due to undeveloped testes as much as being affected by any dietary manipulation, and finally 4) the other constituents of broiler diet and enviromental conditions were quite adequate without causing any dietary deficiencies. In another study, Duru [31] reported no significant effects of TT extract (60 and 120 ppm) into broilers diet on feed intake, body weight and feed efficiency at 21 days of age for broilers. In contrast, Sahin [32] showed that supplementing the diet with 8g TT powder can be used as an alternative to antibiotics with respect to growth performance of broiler chickens.Cek et al.[33] also demonstrated that the growth rate of fishes (*Cichasoma nigrofasciatum*) treated with 0.3 g TT extract in one litre water was significantly improved.
Gauthman et al. [26] also showed that the positive effect of TT extract to rats on body weight gain, whereas later in another study Sahin and Duru [12] did not find any significant difference for growth performance in broilers by feeding puncture Vine (*Tribulus Terrestris*) extract. In the present study, addition of TT extract 180 in the diet of male broilers significantly increased the weight of carcass in comparison to the other groups whereas breast, thigh, heart, gizzard, liver, abdominal fat and intestine weights were not significantly altered in the males and females.These results are in agreement with the results ofFekri et al. [2]who reported that the use of 1 and 5 g of TT per kilogram of diet of broiler chickens resulted in improved carcass weight. Although relative weights of liver, heart, gizzard,abdominal fat and intestine did not change. Duru and Sahin [30] observed no significant effects of TT powder into broilers diet on weights of carcass, breast, heart, liver and duodenum whereas TT powder significantly reduced abdominal fat compared to control group. Also, Sahin and Daru [12] showed that TT powder (360 ppm) significantly reduced carcass, liver and heart weights in comparison to control group. In parallel, Sahin [32] demonstrated that dietary TT plant powder addition at the level of 4, 8 and 12 g decreased carcass yield but proven triculus, ileum and jejenum weights were increased by TT powder.

## CONCLUSION

As a conclusion, addition of TT extract in the diet of broiler chickens significantly improve weight gains and feed conversion ratio in broilers fed whit TT extract 180 pp min comparison to other groups whereas, carcass traits were not significantly altered, except relative weight of carcass in male broilers.

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