

Performance, Immune, and Carcass Characteristics of Broiler Chickens as Affected by Thyme and Licorice or Enzyme Supplemented Diets

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Abstract

Numbers of 300 day-old broiler chickens through a CRD design with 5 treatments, 3 replicates and 20 chicks in each pen were used to evaluate the effect of thyme (T), licorice (L), thyme + licorice (TL), and enzyme supplemented (E) diets on performance, immune and carcass characteristics. According to the results, performance traits, immune indices, and carcass traits in herbal medicine and enzyme supplemented diets were improved significantly than control diet ($P < 0.05$). Weight gain and FCR in T and E groups were significantly higher and lower than other groups respectively ($P < 0.05$). Internal organs such as abdominal fat and liver weight as indicators of lipogenesis rate were decreased in T, L, and TL diets than control or E diet significantly ($P < 0.05$). Immune organs such as bursa and spleen weight as indicators of immune situation were increased in TL diet than other treatments significantly ($P < 0.05$). These findings indicated that thyme and licorice singly or in combination as organic herbal medicine can affect performance, carcass and immune characteristics. Also an improved immune organ such as bursa or



spleen in this study indicates that this herbal medicine can promote the immune situation and efficacy of health and livability.

Keywords

Broiler, Enzyme, Licorice, Thyme

1. Introduction

The use of antibiotic in poultry nutrition was banned from year of 2006 due to development of antibiotic resistant bacterial serotype which is the most dangerous threat for global human population [1]. Search for alternatives to antibiotic resulted in safe materials with nature characteristics and mediated by intestinal micro flora such as medicinal plants and exogenous enzymes supplementations [2] [3]. Different medical plants have been used in recent years to improve growth, health and physiological aspects of poultry [4]. Dietary enzyme addition is one of the main strategies to achieve gut health through breakdown of large molecules inside the gut and reducing intestinal viscosity, prevention of bacterial fermentation and producing of injurious products via intestinal micro flora [3] [5].

Thyme (*Thymus vulgaris*) is an aromatic herb, no perennial and a member of *lamiaceae* family which has been reported to have anti-microbial, anti-viral, anti-coccidial, antioxidant and appetite inducing effect. The main active substance of thyme is thymol as phenolic component which commonly used as anti-bacterial material [6] [7].

Licorice (*Glycyrrhiza galabra*) is another aromatic herb, no perennial and a member of *leguminosae* family which has been reported to have anti-microbial, anti-viral, anti-inflammatory, antioxidant and appetite inducing effect such as thyme. The main active substance of licorice is glycyrrhizic acid and flavonoids as anti-inflammatory and antioxidant components [1] [8].

In this study as a main aim the effects of two dietary medicinal plants singly or in combination in comparison with exogenous enzyme supplemented diet were evaluated on growth, immune and carcass traits of broiler chickens.

2. Materials and Methods

An experiment was designed and number of 300 day-old broiler chickens through a CRD design with 5 treatments, 3 replicates and 20 chicks in each pen were used to evaluate the effect of thyme (T), licorice (L), thyme + licorice (TL), and enzyme supplemented (E) diets on performance, immune and carcass characteristics. The experimental traits were included feed intake, gain, and feed conversion ratio to assay the performance and carcass parts including breast, leg and carcass percentage to assay the carcass characteristics, and further were evaluated the internal organs such as bursa and spleen to assay the immune situation. Treatments were included as follow: Control diet (corn-soy based diet

without any additive), Thyme diet (control plus thyme powder), Licorice diet (control plus licorice powder), Mixed herbal medicine diet (control plus thyme and licorice powder equally), and Enzyme diet (control plus enzyme supplementation). Diets were designed as starter and grower based on NRC [9] recommendations. Feed and water were offered *ad libitum* in all period of experiment. Weight gain, feed intake and FCR were measured for starter and grower periods. The lightening schedule was 23 h light and 1 h darkness at 32°C in first day and subsequently reduced 3°C in each week until third week. At 42 days of age 3 birds per each replicate were randomly selected and slaughtered and carcass traits plus organelle weights were measured. All data were analyzed using GLM procedure of SAS software (2004). Duncan's Multiple Range Test was used for comparison of means ($P < 0.05$).

3. Results and Discussion

The effects of thymus, licorice, thymus + licorice, and enzyme diets on performance traits, carcass traits and related immune organelles are shown in **Table 1** and **Table 2**.

According to the results, performance traits including feed intake, gain and feed intake, carcass traits including dressing percentage and carcass parts such as breast and leg accompany with internal organs and related immune organelles such as burse and spleen weight in herbal medicine and enzyme supplemented diets were improved significantly than control diet ($P < 0.05$). Internal organs such as abdominal fat and liver weight as indicators of lipogenesis rate were decreased in herbal medicine diets than control or enzyme supplemented diet

Table 1. Effect of different diets on performance traits of broilers.

Treatments	Control	T	L	TL	E	SEM
Starter (1 - 21 day)						
Feed Intake (g/bird)	62.2 ^a	60.6 ^b	60.7 ^b	61.5 ^{ab}	61.6 ^{ab}	1.22
Gain (g/bird)	44 ^b	45.6 ^{ab}	44.8 ^{ab}	45.9 ^a	45.9 ^a	0.25
FCR (g/g)	1.42 ^a	1.33 ^b	1.36 ^b	1.34 ^b	1.34 ^b	0.04
Grower (22 - 42 day)						
Feed Intake (g/bird)	175.6 ^a	174.4 ^a	169.9 ^b	171.5 ^{ab}	170.3 ^{ab}	2.22
Gain (g/bird)	98.1 ^a	99.7 ^a	92.3 ^c	95.4 ^b	99.8 ^a	1.11
FCR (g/g)	1.79 ^{ab}	1.74 ^{ab}	1.84 ^a	1.80 ^a	1.70 ^b	0.06
Total Period (1 - 42 day)						
Feed Intake (g/bird)	118.3 ^b	117.7 ^b	115.8 ^b	123.3 ^a	116.7 ^b	2.10
Gain (g/bird)	70.4 ^a	72.8 ^a	69.4 ^c	71.7 ^b	72.5 ^a	1.46
FCR (g/g)	1.70 ^{ab}	1.61 ^b	1.70 ^{ab}	1.73 ^a	1.61 ^b	0.07

Notes: 1) T, L, TL, and E are Thymus, Licorice, Thymus + Licorice, and Enzyme treatments. 2) Means with different superscript letters significantly different at level of 0.05.

Table 2. Effect of different diets on carcass traits, internal organs and related immune organelles of broilers.

Treatments	DP	Breast	Leg	AF	Liver	Burse	Spleen
Control	68.43 ^b	42.60 ^a	30.33 ^a	2.74 ^a	4.08 ^a	0.14 ^b	0.15 ^b
T	68.74 ^b	41.64 ^b	29.10 ^b	2.24 ^b	3.46 ^b	0.15 ^b	0.15 ^b
L	70.03 ^a	41.75 ^b	30.37 ^a	2.58 ^{ab}	3.70 ^{ab}	0.15 ^b	0.16 ^b
TL	70.73 ^a	42.35 ^a	30.04 ^a	1.94 ^c	3.27 ^b	0.18 ^a	0.19 ^a
E	70.52 ^a	42.16 ^a	30.95 ^a	2.01 ^c	3.92 ^a	0.14 ^b	0.16 ^b
SEM	0.65	0.46	0.35	0.05	0.11	0.01	0.01

Notes: 1) T, L, TL, and E are Thymus, Licorice, Thymus + Licorice, and Enzyme treatments. 2) DP: Dressing Percentage, AF: Abdominal Fat. 3) Means with different superscript letters significantly different at level of 0.05.

significantly ($P < 0.05$). Immune organs such as burse and spleen weight as indicators of immune situation were increased in mixed herbal medicine diet than other treatments significantly ($P < 0.05$).

These findings indicated that thyme and licorice singly or in combination as organic herbal medicine can affect performance, carcass and immune characteristics. These effects are positive and improved the efficiency of feed intake and growth, also increased the carcass part weights and decreased the abdominal fat pad weight accompany with reducing the liver weight which per se indicated decreased lipogenesis rate in liver and uptake the fat by this organ. Also improving the weight of immune organelles such as burse and spleen indicates that herbal medicines can promote the immune situation and efficacy of health and livability. These findings are in line with other relevant research reports [2] [10]. Increasing immune organ weights induced by herbal medicine metabolites such as phenolic compounds and glycyrrhizic acid in thyme and licorice well defined [7] [8]. These compounds have promoting effects on gastrointestinal tract and immune system to improve growth and health characteristics of birds [7] [8] [11]. All of data comprised simultaneously with a strong common feed additive to test and screen the results with a good criterion as positive control in addition to negative control or corn-soy based diet without any additives.

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