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Performance development of broiler chickens fed diets containing the seeds of *Silybum marianum* L. and *Thymus vulgaris* L.

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ABSTRACT

Background & Aim: Medicinal plants is very potential to be used as a supplementary feed as well as feed additive in broilers. This experiment was conducted to investigate the effects of milk thistle (MT) and thyme seeds (TS) on the performance in broilers.

Experimental: In this study, 160 one-day-old (Ross 308) male broiler chicks were divided randomly into four major groups with 4 replicates based on a completely randomized design. Dietary treatments was included; i.e., (A) Control, (B) diet with 20 mg per kg of MT, (C) diet with 20 mg per kg of TS and (D) diet with 20 + 20 mg per kg of MT and TS, respectively. The birds were reared for 35 days in wooden pens. Also, feed and water were provided *ad libitum*. Feed intake (FI) and body weight gain (BWG) were measured in 3 stage (one-14, 14-28 and 28-35 days) for each replicate and feed conversion ratio (FCR) was calculated.

Results: At One to 28 days of age, feed intake, body weight gain and feed conversion ratio were no affected by dietary supplementation, while the percentage of abdominal fat was reduced by 3.14%, 3.11% and 3.32% for groups (B), (C), and (D), compared to group (A) 4.23%, respectively ($P < 0.05$). Birds fed the (D) supplemented treatment (MT plus TS) had the greatest FI and BWG levels ($P < 0.05$) than the control birds (group A) at 28 to 35 days. However, dietary supplementation (MT and/or TS) reduced ($P < 0.05$) the conversion ratio levels in the 28 to 35 days of study, and this effect was more pronounced for the (D) treatment (MT plus TS).

Recommended applications/industries: In conclusion, the present research indicated that supplements of powdered thistle seeds and/or thyme seeds have a protective influence on the growth performance in broiler chicks.

1. Introduction

Several plants and herbs such as thistle seed (*Silybum marianum* L.) and thyme seed (*Thymus vulgaris* L.) have been used directly or indirectly for the treatment of various human and animal ailments (Jacobs *et al*., 2002). Silymarin is a flavonoid found in the seeds of the herb known as milk thistle (MT). The main components of the silymarin complex are silybin and silibinin (Tedesco *et al*., 2004). Silymarin is a powerful

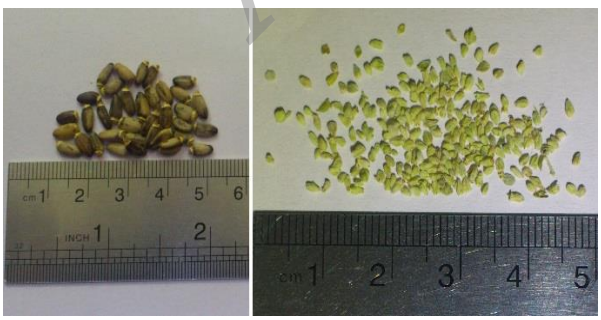
anti-oxidant that has been said to protect liver cells (and other cells in the body and brain) from toxins (Fani makki *et al*., 2014). Silymarin promotes the protein synthesis of liver cells and decreases the oxidation of glutathione (Fani makki *et al*., 2014). Silymarin stimulates protein synthesis and has a contributory hepato-protective mechanism, which accelerates the regeneration process and the production of liver cells (Chand *et al*., 2011; Vargas-Mendoza *et al*., 2014).

Thyme seed (TS) is a plant as to thistle seed (MT) that contains anti-oxidant compounds (Seung-Joo *et al*., 2004). Thyme is a popular medicinal plant that is grown mostly in Mediterranean regions. The major components of TS are thymol and carvacrol, both of which have been shown to possess potent antioxidant properties (Abdulkarimi *et al*., 2011). This study was conducted to evaluate of the thistle seeds (MT) and thyme seeds (TS) on feed intake (FI), body weight gain (BWG), feed conversion ratio (FCR) and abdominal fat in broiler chicks.

2. Materials and Methods

2.1. Descriptions of the milk thistle and thyme seeds

Milk thistle seeds (MTS) are dark brown to grey-brown in color, depending on the variety. There should be no flower or other plant parts present. The seeds have a slightly bitter, oily taste and a faint aroma (Fig. 1a). In addition, the most common form of thyme is *T. vulgaris* or garden thyme with small round, silver-green leaves or seeds and lavender-colored flowers that bloom in late spring (Fig. 1b). Both plant seeds were collected from the outskirts of the Zabol district in Sistan va Baluchestan province, southeastern Iran.



a) b)

Fig 1. Milk thistle seed (a) and thyme seed (b).

2.2. Experimental design and diets

A total of 160 one-day-old (Ross 308) male broiler chicks were obtained from a commercial market, and divided into four groups, i.e., groups A, B, C, and D. Each group consisted of four sub-groups with ten chicks. Between day one and day 35, the chickens were two different diet levels, including (*i*) starter diet (one-14 days) and (*ii*) grower diet (15-35 days) (Table 1). All birds used in the experiment were cared for according to applicable recommendations of the National Research Council (NRC, 1994). The chickens were reared on litter from one to 35 days of age. In addition, the chicks had ad libitum access to the feed and water. The powdered seeds of the herbs were added to the commercial broiler rations (Dual starter and grower), and the four groups were fed four different diets, including:

Group (A) received the control diet

Group (B) received the control diet mixed with 20 mg per kg of MT

Group (C) received the control diet mixed with 20 mg per kg of TS

Group (D) received the control diet mixed with 20 mg per kg of MT plus 20 mg per kg of TS.

The diet was supplemented with multivitamins and electrolytes (Erfan Darou, Iran).

2.3. Data Collection

2.3.1. Performance

Feed intake (FI) and body weight gain (BWG) were determined individually for three different periods, i.e., 1) the starter period (days 1 until 14), 2) the grower period (days 15 until 28), and 3) the finisher period (days 29 until 35). The values were determined and the feed conversion ratio (FCR) was calculated for each sub-group in each group at the end of each period. At the end of the experiment (35 day), two birds from each sub-group were killed after 12 h of fasting and ad libitum access to water. Afterward, abdominal fat were determined.

2.3.2. Statistical analysis

The data were analyzed by SAS (SAS Institute, USA, 1998) in generalized linear models (GLM) method, based on a completely randomized design. The means were evaluated by significant difference and Kramer tests ($P < 0.05$). During this study, established morality requirements for animal models were

observed, and the study was inspected and approved by the Livestock and Poultry Research Institute of Zabol University (South-eastern-Iran). In addition, Zabol's location is 31° 1.0′ 47″ north latitude, 61° 29′ 52″ east longitude, and about 478 m above sea level.

Table 1. Composition of the diets fed to broilers during the starter and grower periods.

Ingredients	Starter (1-14 day)	Grower (15-35 day)
Maize	54.43	50.42
Wheat	-	10.00
Soybean meal (44% CP)	35.00	30.29
Fish meal (60% CP)	3.070	2.040
Soybean fat	3.290	3.570
Dicalcium phosphate	1.730	1.470
Oyster shell	1.160	1.040
Mineral premix	0.500	0.500
Vitamin premix	0.500	0.500
sodium chloride	0.200	0.200
DL-methionine	0.350	0.280
L-lysine	0.240	0.190
Analyzed values		
MEn (Kcal/kg)	2980	3050
CP (%)	22.00	20.00
Lys (%)	1.430	1.240
Met + Cys (%)	1.070	0.950
Thr (%)	0.840	0.740
Ca (%)	1.050	0.900
P (%)	0.520	0.450

3. Results and Discussion

3.1. Performance parameters

Table 2 shows the data that were acquired for feed intake (FI), body weight gain (BWG), feed conversion ratio (FCR) and abdominal fat. There was significant difference ($p < 0.05$) in the percentages of abdominal fat compared with the control (Group-A). The supplements added to the feed for groups (B), (C), and (D) significantly decreased ($p < 0.05$) liver abdominal fat compared to the control. In addition, there were no significant differences observed in the percentages of abdominal fat among groups (B), (C), and (D). Other investigators (Ocak *et al.*, 2008) reported that the consumption of thyme leaves has been shown to increase the abdominal fat in broilers, which leads to their having a faster grow rate. However, the use of TS as a dietary supplement (C group) reduced abdominal fat which is in agreement with the results of Al-Kassei (2009), who fed broiler chickens 200 ppm of TS alone. It is related to the decreased absorption of cholesterol and triglycerides from the gut or their synthesis in liver, because a significant correlation was obtained between the increased serum cholesterol and the increased weight of abdominal fat.

In 28 to 35 days of age, the feed intake (FI) and body weight gain (BWG) were higher ($p < 0.05$) in broilers fed the TS plus MT-supplemented diet (group D) than the control group. While, the effect of TS and MT in group-D on feed intake and body weight gain disappeared at one to 28 days of age (Table 2). Feed conversion ratio (FCR) of broilers was markedly influenced by treatments. So far, birds fed diets containing MT and TS (group-D) had the lowest conversion ratio ($p < 0.05$). Previous studies have reported varying effects of herbal plants or their extracts on feed intake at early stages of the chick's lives (Cross *et al*., 2002, 2007; Demir *et al.*, 2003; Lee *et al*., 2003; Bampidis *et al.*, 2005). It can be hypothesized that this different effects may be due to low palatability of the feed when MT and/or TS is included. This results indicated that the use of 20 mg per kg feed additive as MT and/or TS could improve the growth rate of broilers significantly ($P < 0.05$). The results of this study are also the same with this author findings (Cross *et al*., 2002, 2007; Bampidis *et al.*, 2005; Demir *et al.*, 2003; Lee *et al*., 2003). The increased body weight of broilers achieved by adding thyme in the proportion of 5 gr per kg thyme could be attributed to its positive effect on the digestibility of nutrients, as reported by Langhout (2000). The mechanisms of the actions of herbal products are not clearly understood yet. Fani Makki et al. (2003) also confirmed that milk thistle resulted in a significant ($P < 0.05$) increase in body weight, and they attributed this effect to antioxidant activity that stimulated protein synthesis by the birds' enzymatic systems. Therefore, it may be said that the milk thistle and/or thyme supplemented diet has an advantage in broiler performance although no significant differences in feed intake, body weight and conversion ratio were observed between One to 28 days of age.

4. Conclusion

Our data indicated that thistle seed and/or thyme seed affected the growth performance at 28 to 35 days of this study. Consequently, it can be suggested that dry

thistle seed and/or thyme seed leaves can be used particularly in diets of chick birds where digestion problems at growing lead to scouring and a growth check. However, the milk thistle or thyme effects in the abdominal fat pad should be taken into account for carcase quality and processing and deserves further study. Moreover, different active principles of aromatic plants may have different efficiencies in this respect. Further studies on the effects of higher levels of thistle seed or thyme seed on colonization and proliferation of microorganisms in the broiler intestine, and weight gain and feed efficiency are necessary.

Table 2. Effect of different dietary treatments on growth performance and the percentages of abdominal fat in broiler chicks.

Characteristics	Age (day)	Treatments				±SEM	*P value*
		A (Control)	B (MT)	C (TS)	D (MT+TS)		
Feed intake	1-14	402.3	405.6	415.3	439.6	2.44	0.089
(g/bird)	15-28	1260.4	1263.6	1279.3	1304.2	16.1	0.566
	29-35	801.4 b	831.8 ab	843.3 ab	994.2 a	9.11	0.012
Body weight gain	1-14	285.2	292.4	294.4	299.8	2.79	0.443
(g/bird)	15-28	870.4	872.9	876.6	887.3	8.12	0.473
	29-35	444.1 c	550.6 ab	656.3 ab	864.2 a	6.19	0.007
Feed conversion ratio	1-14	1.41	1.38	1.41	1.46	0.01	0.561
(g/bird)	15-28	1.44	1.44	1.45	1.47	0.02	0.532
	29-35	1.81 a	1.51 ab	1.28 b	1.15 c	0.02	0.003
Abdominal fat (%BW)	35	4.23 a	3.14 b	3.11 b	3.32 b	0.34	0.033

[a, b] Means with different superscripts in the same row are significantly different $p < 0.05$.

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