Growth performance and some carcass charactristics in broiler chickens supplemented with Thymus extract(*Thymus vulgaris*) in drinking water

[1]Rahim Abdulkarimi, [2]Ali Mirza Aghazadeh,[2] Mohsen Daneshyar

1- Islamic Azad University, Boukan Branch, Boukan, Iran
2- Department of Animal Science, Faculty of Agriculture, Urmia University, Urmia, Iran

Rahim.abdulkarimi@yahoo.com

Abstract: The effects of thyme extract (*Thymus vulgaris*) supplementaion in drinking water was evaluated on growth performance and some carcass charactristics . A total of 160 day-old broiler chicks (Ross 308) were assigned to 4 treatment groups with 4 replicate and 10 bird per each. All the chickens were fed a similar basal diet, but received different levels of 0.0% (ZT), 0.2% (LT), 0.4% (MT) and 0.6% (HT) alcoholic extract of Thyme vulgaris during a 42 period. LT recived birds had the highest FI between the treatments during the grower period and whole the experimental period. BWG of LT birds was higher as comperd to MT birds during whole the experimental period ($P\leq0.05$). During the grower period, both the LT and HT birds had lower FCR as compared to ZT birds ($P\leq0.05$). In orthognal contrasts, thyme extract supplementation in drinking water increased FI during starter period ($P\leq0.05$) whereas decreased FCR during the starter, grower and whole the experimental periods ($P\leq0.05$) compared to ZT birds, Relative breast weight of LT and HT birds was higher than that of ZT birds. moreover MT birds had a higher relative wing wheat than ZT birds ($P\leq0.05$). In ortognal contrasts, thyme extract supplementation in drinking water increased relative weights of breast and wing ($P\leq0.05$). It was concluded that thymus extract supplementation in drinking water improves the performance and relative breast weight of broiler chickens that may be related to thyme extract antimicrobial and digestive stimulating properties or its low pH
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1. Introduction

Antibiotic growth promoters have been used in poultry production but increasing the bacterial–resistant strains and special concerns about transfering resistant from animals to humans via food chain, have caused the decreased or baned usage of antibiotics in poultry industry (Khachatourians,1998; Kamel, 2001). Recently some alternative components such as probiotics, prebiotics, organic acids and phytogenics fed additive have been introduced instead of antibiotics (Patterson and Burkhoder, 2003; Ricke, 2003). Recent bans and restrictions on the use of animal antibiotic growth promoters stimulated interest in bioactive secondary metabolites of plant source as alternative performance enhancers (Greathead, 2003).

Medicinal plants and their essential oils have been used extensively in food products, perfumery, dental and oral products due to their different medicinal properties (Suppakul et al., 2003). *Thymus vulgaris* is a medicinal herb in the *Lamiaceae* family, cultivated worldwide for culinary, cosmetic perennial and medical purposes. This species has special functions such as antispasmodic, expectorant, antiseptic, antimicrobial and antioxidant (Hertrampf, 2001; Abu-Darwish *et al*., 2009). Thymol (5-methyl-1-2-isopropyl phenol) and carvacrol (5-isopropyl-2-methyl phenol) are the main phenolic components in *Thymus vulgaris* (Masada, 1976). Thyme (extract, oil, and the major components) have shown antibacterial activity against the *Clostridium botulinum* ,*Clostridium perfringens*, *Bacillus subtilis*, *S. sonnei*, *E. coli*, *H. pylori*, *S. typhimurium* , *S. sonnei* , *Bacillus cereus*, *L monocytogenes*, *C. jejuni* and *S. enteric* reported in previous literatures (Nevas et al., 2004; Fan and Chen, 2001; Tabak et al., 1996; Juven et al., 1994; Ultee et al., 2000; Friedman et al., 2002; Thakare, 2004). Performance promoting effects of essential oil, extract, powder or principal components of thyme have been demonstrated in poultry (Al-Kassie, 2009; cross et al., 2007, Al-Mashhadani et al., 2011; Lee et al., 2003; Bolukbasi and Erhan., 2007; El-Ghousein and El-Beitawi., 2009). For example,supplementation of 200 mL thyme extract per 1000 liter drinking waters in broiler chickens led to improvement of body weight gain and feed conversion ratio (Feisi and Bijanzad., 2010)., Moreover, Rahimi et al (2011) reported that dietary

thyme extract solution (0.1%) in water increased the performance and lactic acid counts wherase reduced the *E.coli* numbers (P<0.05). In recent study, high levels of thyme extract (up to 0.6%) in drinking water were investigated on performance and some carcass characteristics in broiler chickens.

2. Materials and Methods

one hundered and sixty day-old mixed (males and females) broiler chicks (Ross 308) were provided from a local hatchery, weighed on arrivial and assigned to 4 treatment groups with 4 replicate (pen) and 10 bird (5 male and 5 female) per each pen. Water and feed were provided as *ad libitum* consumption. All the chickens were fed the similar starter (day 1-21 of age) and grower (day 22-42 of age) diets in pellet form (Table 1), but received 0.0% (ZT), 0.2% (LT), 0.4% (MT) and 0.6% (HT) alcoholic extract of thymus vulgaris (0.06% thymol and pH=5) during the experimental period (day 1 to day 42). Thymus vulgaris alcoholic extract was prepared using the standard maceration method (Zhang et al., 2005) that have been reported some elsewhere (Abdulkarimi et al., 2011). The solutions of thyme extract in drinking water were prepared daily. The average body weight gain (BWG), feed intake (FI) and feed conversion ratio (FCR) were calculated during the starter (day 1-21), grower (day 22-42) and whole experimental periods (day 1-42). At day 42 of age, two birds per pen (a male and a female) were selected, weighed and killed by decapitation to obtain the carcass characteristics such as relative (percentage of tissue to live body weight) and absolute weights of hot carcass, breast, thigh and wing. The data were subjected to SAS (2002) statistical software (version 9.1) and analyzed based on a completely randomized design using the general linear model (GLM) procedure. When the overall model was statistically different (P<0.05), the Tukey-Kramer multiple comparison test was used to compare the mean values (P<0.05). Moreover, orthogonal contrasts were constructed in order to compare the mean response variables for thyme extract received birds *vs* control birds.

Table 1. Composition of experimental diets

Ingredients (%)	Starter (0-21 d)	Grower (21-42 d)
Corn	54.87	61.78
Soybean meal (44 % protein)	36.72	26.36
Fish meal	1.31	4.50
Vegtable oil	3.00	4.00
Limestone	1.15	1.05
Dicalcium phosphate	1.94	1.49
Vit. and min. premix[1]	0.50	0.50
Salt	0.30	0.30
DL-methionine	0.21	0.02
Total	100.00	100.00
Calculated analysis		
ME (kcal/kg)	2937	3100
CP (%)	21.44	19.37
Calcium (%)	1.05	1.00
A. Phosphorus (%)	0.51	0.50
Sodium (%)	0.16	0.14
Arginine (%)	1.41	1.23
Methionine + Cystine (%)	0.91	0.69
Lysine (%)	1.20	1.10
Tryptophan (%)	0.31	0.26

[1] provide per kilogram of diet: vitamin A, 15000 IU; vitamin D_3,8000 IU; vitamin K3, 3 mg; B_{12}, 15 µg; niacin, 32 mg; choline, 840 mg; biotin, 40 µg; thiamine, 4 mg; B_2 (riboflavin), 6.6 mg; pyridoxine, 5 mg; folic Acid, 1 mg; Zn, 80 mg; Mn, 100 mg; Se, 200 mg; Fe, 80 mg; Mg (magnesium oxide), 12; Cu, 10 mg; Ca (calcium pontatenate), 15 mg; iodeine,1 m

3. Results

Performance

The effects of thyme extract on feed intake, body weight gain and feed conversion ratio are shown in Table 2. There was no significant difference between the treatments for FI during the strater period. But LT recived birds had the highest FI between the treatments during the grower period and whole the experimental period. During the starter period, LT birds had a higher FI as compared to MT birds (P≤0.05) while there was no significant differences between the other treatments (P>0.05). During whole the experimental period, FI of LT birds was higher as compared to ZT and MT birds (P≤0.05) but no significant differences were observed betweeen the other treatments (P>0.05). No significant differences were observed between the treatments for BWG during the starter and grower peiords (P>0.05). BWG of LT birds was higher as comperd to MT birds during whole the experimental period (P≤0.05) but no significant diffirences were observed between the others (P>0.05). There were no significant differnce between the treatments for FCR during the starter period and whole the experimental period (P>0.05). During the grower period, both the LT and HT birds had lower FCR as compared to ZT birds (P≤0.05). In orthognal contrasts, thyme extract supplementation in drinking water increased FI during starter period (P≤0.05) whereas decreased FCR during the starter, grower and whole the experimental periods (P≤0.05) compared to ZT birds,

Carcass characteristics

There was no significant diffirences between the treatments for relative weights of hot carcass and thigh (P>0.05) (Table 3). Relative breast weight of LT and HT birds was higher than that of ZT birds. Moreover MT birds had a higher relative wing wheight than ZT birds (P≤0.05). In ortognal contrasts, thyme extract supplementation in drinking

water increased relative weights of breast and wing ($P \leq 0.05$).

4. Discussions

Addition of thyme extract in drinking water improved the performance especillay FCR in recent experiment. Altough in opposite to our results, dietary supplementation of thyme powder or oil have not changed the performance of broiler chickens (Bolukbashi et al., 2006; Demir et al., 2008; Ocak et al., 2008; Hernandez .,et al 2004), but our results are in agreement with those of El- Ghosein and El-Beitawi (2009) that indicated significantly improved performance of birds fed 0.5, 1.0, 1.5 and 2.0% of crushed thyme compared with control birds. In the same way, Bolukbasi and Erhan (2007) reported the improwed FCR and decreased fecal E.coli cocentration in laying hens fed 0.1 or 0.5% thyme powder ($P<0.05$). Similar results observed by Al-Kassei (2009), who fed 200 ppm thyme and cinnamon oils to broiler chickens and indicated better BWG, FI and FCR. In other consistent study, Feizi and Bijanzad (2010) demonestrated the positive effects of Thyme extract (200 mL per 1000 liter drinking water) on performance in broiler chickens.

Essential oil, tannins, glycosides, saponins and others are the components of thyme extract (Escop, 2003). thymol and carvacrol are the major components of thyme essential oil (Masada.,1976). The binificial effects of these components have been recognized on gut microflora (Helnander et al., 1998) and digestive system stimulation of poutry (Williams and Losa., 2001; Langhout, 2000). Intestinal microflora has a negative effect on bile salts secretion (Freigher and Dashkevicz, 1987) so lowering microbial effect of extract may be in the reason of higher synthesis or secretion of bile salts from liver. This phenomenon possibly lead to increase the fatty acids avaibility and hence performance improvement. improved ileal apparent digestibility of protein in broilers by supplementation of essential oil extract from orange, cinnamon and pepper (Hernandez et al., 2004) supports our hypothesis for better performance of thyme extract recived birds. Lower pH of thyme extract (5.5) could be the other reason that possibly could have caused the lower intestinal pH in thyme consumption extract received birds.

Although we didn't investigate the gut microflora in our study, but changes of gut microflora could be the other reason for better performance of

Table 2. Feed in take, body weight gain and feed coversion ratio of broilers supplemented with different thyme extract levels in drinking water

Parameter	Feed in take(g/d/bird)			Body weight gain (g/d/bird)			Feed conversion ratio(g/g)		
Treatment	1-21 d	22-42 d	1-42 d	1-21 d	22-42 d	1-42 d	1-21d	22-42 d	1-42 d
ZT(0.0%)	35.1	66.4 ^{ab}	49.6 ^{bc}	50.56	137.1	91.1 ^{ab}	1.44	2.15 ^{a}	1.83
LT(0.2%)	37.65	76.1^{a}	53.8 ^{a}	52.56	143.2	92.2 ^{a}	1.39	1.9 ^{b}	1.71
MT(0.4%)	36.92	61.2 ^{b}	47.67^{c}	51.39	128.2	84.3 ^{b}	1.39	2.09 ^{ab}	1.76
HT(0.6%)	37.0	71.4 ^{ab}	52.26 ^{ab}	50.56	136.5	89.7 ^{ab}	1.36	1.94 ^{b}	1.72
P value	0.11	0.01	0.02	0.32	0.22	0.03	0.14	0.01	0.07
SEM	0.40	1.67	0.74	0.43	2.54	1.11	0.01	0.03	0.02
Orthogonal contrasts (P<0.05)									
T *versus* C	0.05	0.41	0.38	0.33	0.87	0.43	0.05	0.04	0.02

[a-c] Means with different superscripts in the same column are significantly different at P<0.05.

Table 3. Hot carcass, breast, thigh and wing relative weights in broilers recieved different thyme extract levels in drinking water

Parameter	Hot carcass (%)	Breast (%)	Thigh (%)	Wing (%)
Treatment				
ZT(0.0%)	71.24	24.12^{b}	20.35	7.74^{b}
LT (0.2%)	73.46	26.75^{a}	19.43	7.96^{ab}
MT (0.4%)	72.45	25.29^{ab}	20.62	8.75^{a}
HT (0.6%)	74.42	26.66^{a}	19.25	7.96^{ab}
P value	0.21	0.011	0.53	0.8
Pooled SEM	0.56	0.34	0.39	0.1
Orthogonal contrasts (P<0.05)				
T versus C	0.17	0.041	0.46	0.05

[a-c] Means with different superscripts in the same column are significantly different at P<0.05.

thyme extract received birds. Tschirch (2000) indicated that carvacrol (thyme essential oil component) had a stimulating effect on *Lactobacillus proliferation.* Rahimi et al (2011) showed lower E.coli and higher Lactic acid bacteria in ileal thyme extract received broiler chickens from drinking water. Breast and wing weights significantly affected by thyme consumption in recent experiment. several researchers (Ali et al., 2007; Abdel-Latif., 2002; El-Ghosein and Al- Beitawi; Al-Kassie, 2009) reported the consistent results by supplementation of thyme oil, extract or powder on breast relative weight in broiler chichs. Amino acids especially lysine is critical for muscle development such as breast muscle. The relationship between the dietary lysine level and breast weight (%) has been confirmed (Kerr et al.,1999; Nasr and Kheiri., 2011). Intestine harmful bacterial stimulate the lysis of amino acids and di- aminasion process (lee et al., 2003) and consequently reduces the availability of lysine for broilers. But antimicrobial properties of thyme possibly prevents the lysis of lysine and increase the lysine absorption and hence enhanced breast and wing relative weights.

5. Conclusion

In conclusion, Thymus vulgaris extract supplementation in drinking water improves the performance and relative breast weight of broiler chickens. These benificial effects of Thyme extract may be related to its antimicrobial and digestive stimulating properties or low pH.

Corresponding Author:
Rahim Abdulkarimi
Islamic Azad University, Boukan branch, Boukan, Iran
E-mail: rahim.abdulkarimi@yahoo.com

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