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

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Abstract: The effects of thyme extract(Thymus vulgaris) supplemented in drinking water on growth performance and some carcass charactristics evaluated in present study. A total of 160 day-old broiler chickes (Ross 308) were weighed and based on completely randomized design assigned to 4 treatment groups with 4 replicate and 10 bird per each. All the chickens were fed basal diet, but birds drinking waters supplemented with 0.0% (ZT), 0.2% (LT), 0.4% (MT) and 0.6% (HT) alcoholic extract of Thyme vulgaris during the whole period of the experiment. Birds FCR supplemented with LT were higher than MT at second period (22-42d) and compared with ZT(control) and MT at whole of the study period ($P<0.05$). BWG in LT received birds significantly higher than birds supplemented with MT (from 1-42 days). Also in days 22-42 of age, LT and HT received birds improved FCR value than control (ZT) birds ($P<0.05$). In contrast of thyme supplementation and non supplementation, the birds using thyme extract had a better FCR value ($P<0.05$) compared with ZT birds. Hot carcass and breast absolute weights in broilers fed with LT and HT were greater than MT and ZT(control) birds, and also LT and HT consumption increased ($P<0.05$) wing absolute weight compared with ZT birds. Breast relative weight, significantly effected by LT and HT consumption and birds received these levels, had a higher breast relative weight than ZT(control) birds. Also MT received birds had a higher wing weight(%) than ZT group. Contrast results between Thyme extract receiving groups with control group showed, dietary Thymus vulgaris, increased ($P<0.05$) hot carcass absolute weight, breast and wing absolute and relative weights, compared with non supplemented birds(ZT). In result of the thyme extract consumption, positive effects on performance and carcass characteristics revealed and greatest optimal respons observed in birds supplemented with LT(0.2%) level in overall of study period.

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Introduction

Antibiotics were used as a growth promoters in poultry production but in current decades, considering to the bacterial–resistant strains and special concerns about transfering resistant from animals to man via food chain, and also lower influence on growing process, usage of antibiotics decreased or baned in poultry industry (Khachatourians,1998; Kamel, 2001). Intensive studies have been conducted to find the alternative and to solve this problem, some components such as probiotics, prebiotics, organic acids and phytogenics fed additive introduced instead of antibiotics(Patterson and Burkhoder, 2003; Ricke, 2003). From ancient times, Medical plants and their essential oils have been recognized and used extensively in food products, perfumery, and dental and oral products due to their different medicinal properties (Suppakul et al., 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). *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) and antibacterial activity of thyme (extract, oil, and the major components) against of *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).The beneficial effects of Thyme in forms of oil , extract, powder and or principal components on poultry performance demonstrated (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). In addition, the supplementation of drinking waters with 200cc/1000 liter of Thyme extract, significantly led to enhanced BWG and improved FCR value in broiler chickens (Feisi and Bijanzad., 2010). Furthermore, Rahimi et al (2011) reported that dietary thyme extract (0.1%) soluble in water increased performance and lactic acid counts and reduced E.coli numbers compared with control group ($P<0.05$). In the present study we used the high levels of thyme extract in drinking water, which not applied in previous works to assess the effects on performance and some carcass characteristics in broiler chickens.

Materil and Methods

A total of 160 day-old mixed sex broiler chickes (Ross 308) were weighed and based on completely randomized design assigned to 4 treatment groups with 4 replicate and 10 bird (5 male and 5 female) per each. Water and feed were provided *ad libitum* for 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 birds drinking waters supplemented with 0.0% (ZT), 0.2% (LT), 0.4% (MT) and 0.6% (HT) alcoholic extract of Thyme vulgaris (0.06% thymol and pH=5) during the whole of experimental period. Mentha piperita alcoholic extract was prepared using a standard maceration method (Zhang et al., 2005). We used this methods in the previous study (Abdulkarimi et al., 2011). For this purpose, vegetative parts of the shade dried Mentha piperita full bloom stage were crushed and soaked in ethanol 80% in 1:5 ratios (w/v) for 72 h on a shaker. Then the extract strained and its menthol content was determined by TLC (thin layer chromatography) method, the pH value by using a pH meter instrument (HQ40D, Hach Co., Loveland, CO, USA). All treatments (drinking waters) were prepared daily. The average body weight gain and feed intake was calculated per pen for one-week periods and used to calculate feed conversion ratio at starter, grower and whole period of experiment. 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 quantity traits such as ,Hot carcass, Breast, Thigh and Wing relative (percentage of live body weight) and absolute weights. The data were subjected to SAS (2002) statistical software (version 9.1) and analysed 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.

Results

Performance

The effects of Thyme extract on Feed in take, body weight gain and Feed conversion ratio are shown in Table 2. Birds FCR supplemented with LT were higher than MT at second period and compared with ZT(control) and MT at whole of study period ($P<0.05$). BWG in LT received birds significantly higher than birds supplemented with MT (from 1-42 days). Also in days 22-42 of age, LT and HT received birds improved FCR value than control (ZT) birds ($P<0.05$). In contrast of thyme supplementation and non supplementation, the birds used thyme extract in drinking water had a better FCR value ($P<0.05$) compared with ZT birds.

Carcass characteristics

Hot carcass and breast absolute weights in broilers fed with LT and HT were greater than MT and ZT(control) birds, and also LT and HT consumption, increased ($P<0.05$) wing asolute weight compared with ZT birds (Table 3). Breast relative weight, significantly effected by LT and HT consumption and birds received these levels, had a higher breast weight(%) than ZT(control) birds. Also MT received birds had a higher wing weight(%) than ZT group (Table 3). Contrast result between Thyme extract received groups with control group showed, dietary Thymus vulgaris in drinking water, increased ($P<0.05$) hot carcass absolute weight, breast and wing absolute and relative weights, compared with non supplementation birds(ZT) (Table 3).

Discussion

In our study, addition of thyme extract in drinking water improved performance and significantly effected on FCR value compared with non supplemented group. Also FIT and BWG in birds that supplemented with LT, were higher and FCR was better than other levels at periods that different marked were observed. This results are in agreement

with those of El- Ghosein and El-Beitawi (2009) reports, they indicated, birds dieted with 0.5, 1.0, 1.5 and 2.0% of crushed Thyme, significantly enhanced performance compared with control birds and higher optimal effects was showed in 2.0% received birds. In the same way, Bolukbasi and Erhan (2007) demonestrated, dietary Laying Hens with both 0.1 and 0.5% levels of Thyme powder improwed FCR and decreased fecal E.coli cocentration ($P<0.05$) as compared with control group. Similary respons observed in study was conducted by Al-Kassei (2009), who concluded, chicks deited with 200 ppm thyme and cinnamon oils, had a haigher BWG and FIT and better FCR value than non supplemented chicks. Furthemore, Feizi and Bijanzad (2010) determined effects of Thyme extract(200cc/1000 liter) in drinking water on performance in broiler chickens. But in opposite results, supplementation of broiler diet with Thyme powder or oil not stimulated performance as compared with cotrols (Bolukbashi et al., 2006; Demir et al., 2008; Ocak et al., 2008; Hernandez .,et al 2004). Thyme extract has essential oil, tannins, glycosides, saponins and other components (Escop, 2003). The major componens of thyme essential oil are thymol and carvacrol (Masada.,1976). The binificial effects of this components on depressing of gut microflora (Helnander et al., 1998) and stimulation of poultry digestive system (Williams and Losa., 2001; Langhout, 2000) recognized. Intestinal microflora has a negative effect on bile salts secretion (Freigher and Dashkevicz, 1987) and lowering microbial counts by utilization of extract may be correlated with increase in synthesis or secretion of bile liquid . this cause can lead to increase in fatty acids avibility and in continue enhanced performance. In previous study was conducted by use (Abdulkarimi et al., 2011), thyme extract consamption decreased plasma lipids and abdominal fat in broilers. We suggested, this result possibly related with cosiderable effects of thyme extract on fats metabolism. In agreement results, Hernandez et al., (2004) who reported that a supplementation of essential oil extract from orange, cinnamon and pepper improved ilec apparent digestibility of broilers. In added, use of antibiotics could thinned muscularis mucosa in animal (Lesson,1984) and reduced competition between animals and microflora to absorption and utilization of nutrients (Vukic Vramjes et al 1995). Regarding to the similarly effects as same as antibiotics, it seem, epithelium layer effected by Thyme extract and enhancement of nutrients absorption expected. The second resean may be related with intestinal pH that effected by Thyme consumption. In some studies, increase in Growth performance showed in broilers supplemented with organic acids and probiotics (Huang et al .,2004; Skrivanova and Marounek ,2007; Roser,2006) which components reduced pH in intestinal tracts and impaired the harmful microflora ecosystem. A negative relation observed between harmful and useful microbial in broilers , (Vidanarachchi, *et al.*, 2006; Dalkılıç, 2005) while numbers of lactic acid bacteria in the ileum and caecal contents increased, caecal coliform and *C.perfringens* counts significantly decreased. A like with organic acids and probiotics, this action mode can attributed regarding Thyme extract influence on performance in the present study. Thyme extract pH that used in our experiment was acidity (pH =5) and it probably improved the beneficial microflora ecosystem with produce an appropriate pH and reduce harmful bacteria in broilers intestinal. Tschirch (2000) indicated, carvacrol (thyme essential oil component) has a stimulating effect on *Lactobacillus proliferation*. Jamroz *et al*. (2006) reported that plant extract supplement also significantly increases the *Lactobacillus* numbers. Our argument, supported by Rahimi et al(2011), they observed broilers feeding with Thyme extract (1.0%) in drinking water, had a lower E.coli and higher Lactic acid bacteria numbers in ileal contents of broilers compared with control chicks ($P<0.05$).

Hot carcass, breast and wing weights significantly effected by Thyme diet *vs* control birds (Table 3) and increased. In agreement with this result, several recearchers (Ali et al., 2007; Abdel-Latif., 2002; El-Ghosein and Al- Beitawi; Al-Kassie, 2009) reported that supplementation diet with thyme plant (in forms of oil, extract or powder), leads to increase in carcass parameters weight. Amino acids are critical for muscle development and Lysine content in breast muscle is relatively higher than other AA. On the other sids, utilization of lysine (low level) reduced breast meat yield compared with other muscles (Tessseraud *et al.*, 1996). In added relation between lysine levels and breast weight(%) has been confirmed (Kerr et al.,1999; Nasr and Kheiri., 2011). Considering this fact that intestine harmful bacterial stimulate the lysis of amino acids and di- aminasion process (lee et al., 2003), and regards to Thyme antimicrobial properties, we assume which lysine absorption with other amino acids increased by use of Thyme extract, and in consequently, breast and hot carcass weights inhanced.

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

Table 2. Feed in take, Body weight gain and Feed coversion ratio in broilers supplemented with 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, Breat, Thigh and Wing relative and absolute weights in broilers supplemented with Thyme extract levels in drinking water

Parameter	Hot carcass		Breast		Thigh		Wing	
Treatment	(g)	(%)	(g)	(%)	(g)	(%)	(g)	(%)
ZT(0.0%)	1531[b]	71.24	519[b]	24.12[b]	438	20.35	165 [b]	7.74[b]
LT (0.2%)	1943 [a]	73.46	708[a]	26.75[a]	517	19.43	208 [a]	7.96[ab]
MT (0.4%)	1524 [b]	72.45	508[b]	25.29[ab]	434	20.62	183 [ab]	8.75[a]
HT (0.6%)	1928 [a]	74.42	690[a]	26.66[a]	495	19.25	205 [a]	7.96[ab]
P value	0.004	0.21	0.001	0.011	0.24	0.53	0.004	0.8
Pooled SEM	60.5	0.56	24.7	0.34	17.4	0.39	5.18	0.1
Orthogonal contrasts (P<0.05)								
T versus C	0.016	0.17	0.007	0.041	0.21	0.46	0.0008	0.05

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

Conclusion

Our results indicated that dietary Thymus vulgaris extract supplementation in drinking water effectes the growth performance and carcass caracteristics *versus* non supplementation birds and the optimal respons observed with 0.2% and 0.6% levels respectively. Benificial effects of Thyme may be related with antimicrobial properties, digestive stimulating, increase in bile salts and digestive enzymes secretion and also prepared favorable condition as same as prebiotics and organic acids for useful microflora (*Lacto bacillus*) via reduction of pH value in intestinal tracts.

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