

EFFECT OF ANISE, THYME ESSENTIAL OILS AND THEIR MIXTURE (EOM) ON BROILER PERFORMANCE AND SOME PHYSIOLOGICAL TRAITS.

By

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Abstract: *This study was conducted at the Poultry Farm, Animal Resources Dept., University of Baghdad, College of Agriculture, to study the effect of inclusion of anise, thyme essential oils and their mixture (EOM) on broiler performance and some physiological traits. One hundred and twenty eight day-old (Cobb) broiler chickens were allocated randomly to four dietary treatments from 0-38 days of age, with two replicate pens (16 birds/ pen) per treatment. The experimental diets were as follows: control (T1), 300mg anise oils/kg diet (T2), 300mg thyme oils/kg diet and their mixture (200+200mg/kg diet) (EOM). Essential oil was dissolved in vegetable oil and then gently mixed with the standard diets. Result showed that final live body weight and weight gain were significantly ($P<0.05$) higher for T2, T3 and T4 than the control. Feed conversion (g. feed/ g. gain) was significantly ($P<0.05$) better for the group supplemented with thyme oil than the control group. Serum glucose and cholesterol concentration were significantly ($P<0.05$) lower in all supplemented groups than the control. It could be concluded from this study that supplementing broiler diets with essential oil have a beneficial effect on broiler performance and could be used as growth promoters.*

Keyword: *Anise, Broiler performance, Cholesterol, EOM essential oil, Glucose, Thyme.*

INTRODUCTION

Consumer and medical pressure resulted in the systematic removal of antibiotic from animals feed in the European Union, and it was banned in 2006 (Nollet, 2005; Wakeman, 2005 and Cervantes, 2006). Consequently, the poultry industry has been looking for alternative that replace antibiotic (Mellor, 2000 and Bach Knudsen, 2001).

A wide range of spices, herbs, and their extract are known from medicine to exert beneficial action within the digestive tract (Chrubasik et al., 2005). Furthermore, stimulation of digestive secretion, Bile and mucus, as well as enhanced enzyme activity

is proposed to be a core mode of nutritional action (Platel and Srinivasan, 2004). Similarly, essential oils used as feed additives for broiler were shown to enhance activities of trypsin and amylase (Lee et al., 2003). Glucose absorption from the intestine was accelerated in rats fed anise oil (Kreydiyyeh et al., 2003). Phytogetic feed additive were also reported to stimulate intestinal secretion of mucous in broilers, an effect which was assumed to impair adhesion of pathogens and thus contribute to stabilize the microbial eubiosis in the animals gut (Jamroz et al., 2006). These observations support the hypothesis that phytogetic feed additives favorably affect gut functions, but the

number of studies with poultry is still quite limited.

Herbs and spices and essential oils, extracts, dried whole plant and powder have been replaced the antibiotic growth promoter. Essential oils gained importance as antibiotic growth promoter's alternative have been extracted from aromatic plants. They have well-known antimicrobial activity (Deans, 1987; Dorman and Deans, 2000 and Ultee et al., 2002); antifungal (Shin and Lim, 2004; Si et al., 2006 and Ozer et al., 2007) and antioxidant with phenolic compound being the principle active compound (Burt, 2004) and enzymic (Jamroz et al., 2005) activities.

The antimicrobial mode of action is considered to arise mainly from the potential of the hydrophobic essential oils to intrude in to the bacterial cell membrane, disintegrate membrane structure, and cause ion leakage. The beneficial effects of essential oil of thyme on live performance of broiler have been shown in experiments either a lone (Denli et al., 2004 and Halle et al., 2004) or in combination with other essential oils. There is limited data of the beneficial effect of essential oils from thyme on microbial load as well as of specific pathogen (*Salmonella*) on broiler carcasses (Aksit et al., 2006). Recent studies with poultry and swine indicated stabilizing effects of phytogenic feed additive on the ecosystem of gastrointestinal microbiota. Kroismayr et al., (2006) compared blend of essential oils from oregano, anise and citrus peel with an antibiotic growth promoter and reported a decrease in microbial activity in the terminal ileum, cecum and colon for both feed additives. Comparable observation for herbal essential oils were found also in other studies with pigs and broilers (Manzanilla et al., 2004; Mitsch et al., 2004; Namkung et al., 2004; Jamroz et al., 2005 and Castillo et al., 2006). However, limited research has been performed on plant extracts including anise essential oils

alone or in combination with thyme essential oils. (Combining strategies may sometimes prove more beneficial than individual supplementation of feed additives. In broiler chicken (Zhang et al., 2005) speculated that, essential oil-organic acid blend proved to be promising alternative to antibiotic growth promoters. Therefore, the present study aimed to examine either alone or the combination of thyme and anise essential oils on broiler performance and some physiological traits.

MATERIALS AND METHODS

This study was conducted at the Poultry Farms Animal Resources Department, University of Baghdad, College of Agriculture, from October 22 to November 30, 2010, to study the effect of inclusion of anise and thyme essential oils and their mixture (EOM) on broiler performance and some physiological traits. One hundred and twenty eight day-old (Cobb) broiler chicks were allocated randomly utilizing a complete randomize Design (CRD) to three dietary treatments from 1-38 days of age, with two replicate pens (16 bird/pen). The experimental diets were as fellows control (T1), 300 mg/kg diet anise essential oil/kg diet (T2), 300 mg thyme essential oil/kg diet (T3) and 200 mg/kg diet anise plus 200 mg/kg diet thyme essential oil mixture (EOM) (T4). The experimental diets were formulated to be isocaloric and isonitrogenic according to NRC (1994). Essential oils was dissolved in vegetable oil and then gently mixed with the standard diets. The diets were prepared freshly each week from 0-28 days (starter) and from 29-38 days of age were prepared twice a week. The experimental diets contained essential oils either derived from anise (*Pimpinella anisum* L.), Thyme (*thymus vulgaris*) and the EOM contained tow different essential oils derived from anise and thyme. The ingredient and chemical composition of the diet is

presented in Table 1. Feed and water were provided ad libitum.

The birds were kept in four pens (1.2 x 1.2m) broiler house containing wood shaving as litter material. Birds were vaccinated against New castle and Gumboro disease according to their age. Live body weight, weight gain, feed intake and feed conversion ratio (g. feed/g. gain) were measured at 14, 28 and 38 days of age. At the end of the experiment, 2 birds

whose body weights were close to the group average were selected from each replicate. Blood sample were collected from jugular vein for glucose (Asatoor and King, 1954) and cholesterol (Franey and Elias, 1968) determination.

Statistical analysis:

Data were subjected to analysis of variance (SAS, 2001) and significant means were separated by Duncan's multiple range tests (1955).

Table 1. Composition of the experimental diets.

Ingredient	Starter	Grower
	0-28 days	29 to 38 days
Yellow corn	37	46
Wheat	28	22
Soybean Meal (48%)	28	24
Protein con. ¹ (40%)	5	5
Sunflower oil	1	2
Dicalcium phosphate	1	1
Calculated composition of the experimental diet according to NRC (1994)		
Crude Protein (%)	21.94	20.07
Metabolized energy (Kcal /Kg)	2921.9	3038.2
Calcium, (%)	0.84	0.84
Available phosphorus (%)	0.42	0.42
Lysine, (%)	1.20	1.02
Meth. + Cys. (%)	0.82	0.78

Protein concentrate Contain: crude protein 40%, crude fat 7.5%, crude fiber 3%, calcium 12%, phosphorus (av) 4.8, methionine 3.7%, meth+cys. 4.0%, lysine 3.9, sodium 2.2%, metab. Energy 2000%.

RESULTS AND DUSCUTIONS

The effect of different inclusion of essential oils and their mixture (EMO) in the diet on live body weight is presented in Table 2. The data revealed that birds

consuming supplemented diet containing anise, thyme and EMO essential oils had significant (P<0.05) higher final body weight by 11.70%, 10.78% and 12.49% for T2, T3 and T4 respectively as compared with the control group.

Table 2. Effect of anise, thyme and their mixture essential oils on live body weight (g) of broiler chickens.

Age days	Control	Essential oils mg/kg diet			Level of significant
	T1	T2	T3	(EOM)T4	
0-14	333.59±3.59	37.94±5.31	345.63±38.12	382.81±11.56	NS
14-28	1140.12±13.55	1229.25±6.75	1237.08±62.92	1232.32±37.01	NS
28-38	2063.0±9.00 b	2336.50±87.5 a	2312.50±14.50 a	2357.50±89.50 a	*

a,b Means in the same raw with different superscripts in the same raw are significantly ($p < 0.05$) different. N.S.: non significant.

T1: control; T2: 300mg anise oil; T3: 300mg thyme oil; T4: EMO mixture.

The effect of inclusion of essential oils and their mixture (EMO) in the broiler diets on average gain is presented in Table 3. Birds consuming diets containing 300mg/kg thyme oil had a significantly ($P < 0.05$) higher average gain than those on the control group. While there were no significant differences ($P > 0.05$) in average of body gain between T1, T2 and T4 respectively during the period from 14-38

days of age. The overall gain (1-38days) showed that all treated groups with essential oils or their mixture had a significantly ($P < 0.05$) higher gain than the control group (T1). The inclusion of essential oils or their mixture (EOM) to the diets improved final gain by 11.91%, 16.63% and 12.7% for T2, T3 and T4 respectively above the control group.

Table 3. Effect of anise, thyme and their mixture essential oils on average gain (g) of broiler chickens.

weeks	Control	Essential oils mg/kg diet			Level of significant
	T1	T2	T3	T4	
0-14	296.59±3.59	328.94±5.31	303.63±38.21	340.81±11.56	NS
14-28	801.53±17.14 b	858.32±1.43 ab	912.46±3.79 a	849.51±48.57 ab	*
28-38	922.89±22.55 b	1107.25±94.25 ab	1208.17±81.16 a	1125.18±52.49 ab	*
0-38	2021.00±9.00 b	2294.50±87.50 a	2424.25±39.25 a	2315.50±89.50 a	*

a,b Means in the same raw with different superscripts in the same raw are significantly ($p < 0.05$) different. N.S.: non significant.

The effect of different dietary feed supplementation on feed intake is presented in Table 4. There were no significant effect ($p > 0.05$) of dietary treatment on feed consumption .Meanwhile, feed intake for birds fed either dietary anise or thyme (T2 or

T3) were numerically higher by 4.27% and 2.03% respectively as compared to the control, while for birds fed either dietary EMO essential oils (T3) had lower feed intake by 1.32% as compared to the control.

Table 4. Effect of anise, thyme essential oils and their mixture (EOM) on feed intake (g) of broiler chicken.

periods	Control	Essential oils mg/kg diet			Level of significant
	T1	T2	T3	(EOM)T4	
0-14	482.34±12.97	524.37±9.06	465.94±45.31	517.50±0.31	NS
14-28	1289.02±29.65	1350.63±18.12	1281.56±130.00	1341.72±16.40	NS
28-38	1708.0±38.61	1759.70±48.44	1686.40±113.59	1692.20±58.06	NS
0-38	3479.40±55.32	3634.70±57.51	3433.90±28.91	3551.5±74.15	NS

N.S.: not significant.

The effect of anise, thyme and their mixture (EOM) essential oils on feed conversion (g. feed/g. gain) is presented in Table 5. There were no significant differences ($P>0.05$) in feed conversion during the periods from 0 to 14, 14 to 28 and 28 to 38 days of age the overall (0-38 days) feed conversion was significantly ($P<0.05$) better when birds fed dietary supplemented medical oils T2, T3 and T4 as compared to the control (T1). The positive improvement in average gain and feed conversion ratio in the treated groups may be related to anise oil and thyme active compound such as anathol and eugenol in anise oil which increase body weight by destroying of the pathogen in microorganism in the digestive system, increasing production of digestive enzyme, improving utilization of digestion of digestive products and enhancing liver function (langhout, 2000 and Williams and

Losa, 2001). In this study the improvement in body weight, average gain and feed conversion in birds fed dietary anise, thyme and EOM ($P<0.05$) as compared to others fed the control group (T1) could be due to those positive effects of anise, thyme and EOM on digestive system. As shown by Hernandez et al., (2004) who reported that a supplementation of essential oil extract from orange, cinnamon and pepper improved apparent whole tract and ilec digestibility of nutrients in broilers. Additionally, Ertas et al., (2005) reported that the addition of essential oils mix (Oregano, clove and anise) in the diet improved body weight gain, feed intake and feed conversion ratio in broilers. In addition, the improvement of broiler performance in this study may be due to the active ingredient in anise (anathole) and thyme (Listerine) which have antifungus, antimicrobial action.

Table 5. Effect of anise, thyme and their mixture essential oils on feed gain (g. feed/g. gain) of broiler chicken.

periods	Control	Essential oils mg/kg diet			Level of significant
	T1	T2	T3	T4	
0-14	1.62±0.02	1.59±0.00	1.53±0.04	1.51±0.05	NS
14-28	1.60±0.00	1.57±0.02	1.40±0.13	1.58±0.07	NS
28-38	1.85±0.09	1.59±0.09	1.41±0.19	1.50±0.02	NS
0-38	1.69±0.02 a	1.58±0.02 b	1.45±0.09 b	1.53±0.01 b	*

a,b Means in the same raw with different superscripts in the same raw are significantly ($p<0.05$) different. N.S.: non significant.

Serum glucose was significantly ($P<0.05$) decreased in group (T4) when compared with all other groups T1, T2 and T3 Table 6. Meanwhile, serum glucose was significantly ($P<0.05$) lower in T2 and T3 than T1. The average serum glucose levels were 197.60, 179.60, 178.40 and 148.30 mg/dl for treatments T1, T2, T3 and T4 respectively. These results are supported by Lemhadri (2004) who reported that an aqueous organo extract exhibits an anti-hyperglycemic activity in rats with out affecting basal plasma glucose

concentration. Cholesterol concentration was significantly ($P<0.05$) decreased by 9.64, 5.25 and 5.40% in Birds were under T2, T3 and T4 respectively when compared with the control birds (T1).

The data are in agreement with those obtained by Craig, (1999) who reviewed the role of herbs and their essential oils as to their cholesterol lowering properties. The significant effect of the selected oils to inhibit of HMC-CoA reductase in the liver.

Table 6. Effect of anise, thyme and their mixture EOM on serum glucose and cholesterol of broiler chicken.

Items	Control	Essential oils mg/kg diet			Level of significant
	T1	T2	T3	T4	
Glucose (mg/dl)	197.60± 2.60 a	179.60±0.00 b	178.40±0.20 b	148.30±2.50 c	*
Cholesterol (mg/dl)	189.25±4.15 a	172.60±0.00 b	179.80±0.70 b	179.55±1.75 b	*

a,b Means in the same raw with different superscripts in the same raw are significantly ($p<0.05$) different.

It can be concluded from this study that inclusion dietary broiler chicken with 300 mg/kg diet of either anise or thyme and 200 mg anise and 200 mg thyme /kg diet (EOM) improve live body weight, average gain, feed conversion and lower serum

glucose and cholesterol, which may indicate that anise and thyme oils may have synergistic effect on performance and physiological traits that were measured in this study.

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الملخص العربي

تأثير اضافة زيت اليانسون، الزعتر وخليطهما في اداء فروج اللحم وبعض الصفات الفسلجية.

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أجريت هذه التجربة في حقل الطيور الداجنة، قسم الثروة الحيوانية، كلية الزراعة، لدراسة تأثير اضافة زيت اليانسون، الزعتر او خليطهما على الاداء الانتاجي وبعض الصفات الفسلجية لفروج اللحم-مائة وثمانية وعشرون طير (Cobb) بعمر يوم تم توزيعها عشوائيا على اربع معاملات من 0-38 يوما بواقع مكررين (16 طير/مكرر). معاملات التجربة كانت T1=السيطرة، T2= 300 ملغم/كغم علف زيت اليانسون، T3= 300 ملغم/كغم علف زيت الزعتر و T4=200+200 ملغم/كغم من خليط اليانسون و الزعتر.

اظهرت النتائج وزن الجسم النهائي والزيادة الوزنية كانت اعلى معنويا ($P<0.05$) في معاملات اضافة الزيت مقارنة بالسيطرة. كفاءة التحويل الغذائي كانت افضل معنويا ($P<0.05$) لمعاملة اضافة زيت الزعتر مقارنة بالسيطرة. الكلوكوز والكوليسترول في الدم انخفض معنويا ($P<0.05$) في جميع معاملات اضافة الزيت مقارنة بمعاملة السيطرة. يمكن الاستنتاج من هذه الدراسة بأن اضافة الزيوت الاساسية لها تأثير ايجابي في تحسين الصفات الانتاجية وبعض الصفات الفسلجية لفروج اللحم ويمكن استخدامها كمحفزات نمو.

الكلمات المفتاحية: الزيوت الاساسية لليانسون، الزعتر وخليطهما، اداء فروج اللحم، الكلوكوز، الكوليسترول.