Journal of Animal and Poultry Production

Journal homepage: www.japp.mans.edu.eg
Available online at: www.jappmu.journals.ekb.eg

Effects of Dietary Anise Oil, Anise Seed Powder and Turmeric Supplementation on The Productive Performance of Broiler Chickens

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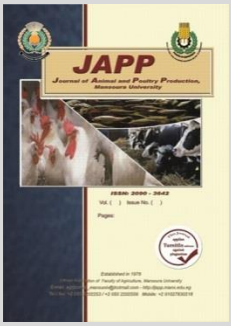

ABSTRACT

A total number of 196 one-day-old Hubbard unsexed broiler chicks were used in seven experimental treatments according to the body weight with four replicates/ each to determine the effect of dietary different levels of anise oil (AO), anise seeds power (ASP) and their mixture from 1 to 35 d of age and during the last week Turmeric was supplemented to the diet on productive performance and economic efficiency. The diet contained gradually levels of anise oil (45 and 90 mg /kg diet), anise seeds (1, and 2 g /kg diet) and their mixture (22.5 mg AO + 0.05g ASP and 45 mg AO + 1 g ASP/kg diet) then during the last week Turmeric was supplemented with 1g/kg diet. Results obtained clearly observed that the diet supplemented with 45 mg AO / kg diet gave significantly higher final body weight and produced the highest weight gain compared to control diet. It is clearly observed that all treatments did not differ from control group in the average feed conversion ratio during the most periods of the experiment. No significant differences on the most studied serum biochemical parameters. The carcass % was significantly increased by using the two levels of AO (45 and 90 mg / kg diet) compared to the control diet. It can be conclude that anise oil, anise seeds or their mixture in broiler diets can be used as a dietary supplementation in diets of broiler chickens to improve the productive performance.

Keywords: Broiler chickens, Anise oil, Anise seed, Turmeric

INTRODUCTION

The effects of bioactive plant substances in animal nutrition may include some aspects as follow: 1- stimulation of appetite and as a result feed consumption 2-Improvement secretion of endogenous digestive enzymes 3- The activation of immune responses 4- Antibacterial and antiviral action 5- Antioxidant properties (Toghyani *et al*., 2011). Beshara et al., (2008) suggested that the effect of commercial synthetic antioxidant on productive performance seemed to be instant meanwhile the natural antioxidants seemed to act gradually and persisting for longer period.

Oxidative stress was happened when the production of reactive oxygen species (ROS) increase over the body's ability to detoxify these harmful reactive species, or to repair the damage due to these types of ROS. However, it is interesting to note that the generation of ROS is a normal production during cellular energy production and a primary weapon of the innate the response of immunity (Iqbal *et al*., 2004). Low control of oxidative stress may be lead to lower productive performance of animals, immune response, poor of meat quality and increased morbidity of birds (Spears and Weiss, 2008).

The lipid bilayer loses its integrity when lipid peroxides are present leading to both cell membrane damage and death (Padmaja *et al*., 1997). The free radicals can produce harmful changes in the cells of body, and these changes are dramatic. For example, the presences a lot of number of oxygen reactive species can cause alternation in the way the cells code genetic material. The formation of mutated proteins can eventually damage the immune system. Free radicals are extremely reactive and their half-life is only milliseconds thus free radical reacts with a normal compound, other free radicals are generated. This chain reaction leads to thousands of events such as changes in protein structure can occur. In addition, peroxidation of polyunsaturated fatty acids in cell membrane leads to a loss functions of this cell (Vasudevan *et al*., 2011).

Supplementation of antioxidants to the diet may be prevent the damage produced by ROS where, antioxidants play very important role in maintain the integrity of the cell membrane from the action of ROS by scavenger the free radicals and breaking process lipid peroxidation which happened in the living tissues (Yu, 1994). There are two major defense mechanisms against damage induced by ROS: 1- Enzymatic which include superoxide dismutase, glutathione peroxidase and catalase 2- Non-enzymatic such as phenolic compounds, vitamins C, A and E (Seven *et al*., 2009).

Among the well-known antioxidants, anise (*Pimpinella anisum*), most herbs and spices contain various chemicals as a part of their intercellular composition and these chemicals can help animals to maintain healthy when are fed these compounds and may extend shelf life of their products if they are treated with them (Youn and Noh, 2001). Anise (*Pimpinella anisum*), a member of the Apiaceae family, is an annual aromatic plant. The part of the plant used, is the fruit, in particular the seed and its essential oil. Anise has been examined for its digestion stimulating

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DOI: 10.21608/jappmu.2021.204696

effect (Cabuk *et al.,* 2003), its antibacterial (Tabanca *et al.,* 2003), antifungal (Soliman and Badea, 2002), and antioxidant properties (Gulcin *et al.,* 2003). Soltan *et al.* (2008) mentioned that 0.5 g anise seed/kg die had stimulatory immune effect and may provide hepato protective effect. Anise oil could be considered as a potential natural growth promoter for poultry (Ciftci *et al.,* 2005). The essential oils in the seeds of anise ranged from 2 to 6 %. Moreover, phenolic acids, estragole and trans-anethole are a powerful phytoestrogen and the main compound (89-95%) of the oil in the anise seeds (Christaki *et al.,* 2011).

Thus, the current research was designed to investigate thoroughly the productive performance of Hubbard broiler chicks resulting from feeding different dietary levels of Anise oil, anise seed powder or mixture of them during the period from 1 to 35 days of age and the broiler response to dietary supplementation of turmeric during the end week of study (28-35 day).

MATERIALS AND METHODS

Broilers' management and their diets:

A total number of 196 one-day-old Hubbard unsexed broiler chicks were used. The chicks were weighed, and randomly divided into seven experimental treatments with four replicates for each. Diets were supplemented by different levels of anise oil (45 and 90 mg/kg diet), anise seeds power (1 or 2g/kg diet) and their mixture from 1 to 35 d of age then during the last week of study turmeric was supplemented to all experimental diets except the control diet. The experimental treatments were control diet without any supplementation (T1), control diet supplemented with anise oil at levels of 45 or 90 mg/kg diet (T2 and T3), control diet supplemented with anise seed powder at 1 or 2 g/kg diet (T4 and T5), control diet supplemented with anise oil 22.5 mg + 0.5 g anise seed powder / kg diet (T6) or anise oil 45 mg + 1g anise seed powder /; g diet (T7)

The broiler chicks were under the same environmental and managerial circumstances. Moreover, the broiler birds were fed on a starter diet contained 23% crude protein (CP) and metabolizable energy (ME) 3060 kcal/kg diet from 1 to 21 days of age then they were switched to the grower diet contained 21% CP and 3180 kcal/kg diet ME from 21 to 35 days and this diet were provided to the broiler birds *ad libitum*. The diets were formulated according to the requirement recommended by NRC (NRC 1994). Chemical composition of the experimental diets of broiler and their calculated analysis are shown in Table (1).

Experimental parameters:

Growth performance:

All broiler birds were weighed during the experimental period at 1, 7, 14, 21, 28 and 35 days of age. Both body weight gain (BWG) and feed intake (FI) and therefore feed conversion ratio (FCR) were calculated through the periods 1–7, 7–14, 14–21, 21-28 and 28-35 days of age. Three chicks / treatment were randomly selected and slaughtered in the end of research. Data of carcass traits such as eviscerated abdominal fat and some characteristics of gastrointestinal tract were calculated as a percentage of live weight.

Table 1. Composition and calculated analysis of the experimental diets.

Ingredients	Starter % (1-21day)	Grower % (21-35day)
Yellow corn	55.00	58.00
Soybean meal (44 % CP)	32.90	30.8
Corn gluten (60% CP)	6.40	4.80
Soybean oil	1.50	2.50
Di-calcium phosphate	1.80	1.60
Limestone	1.50	1.40
premix [1]	0.30	0.30
Sodium chloride	0.30	0.30
DL- Methionine (99%)	0.10	0.10
Lysine	0.20	0.20
Total	100	100
Calculated Analysis [2]		
Crude protein %	22.92	21.24
ME (Kcal / kg)	2949	3027
Crude fiber %	3.79	3.68
Ether extract %	4.22	5.27
Calcium (%)	1.10	1.01
Av. Phosphorus (%)	0.48	0.44
Methionine %	0.53	0.50
Lysine	1.32	1.25
Methionine + Cystin %	0.91	0.85
Price (LE/kg diet) [3]		

1-Each 3 kg of vitamins and minerals premix contains 100 million IU vitamin A; 2 million IU Vit.D3;10 g vitamin E; 1 g Vit.K_3; 1 g vitaminB1; 5 g vitamin B2 ;10 mg vitamin B12 ; 1.5 g vitamin B6; 30 g niacin ; 10 g pantothenic acid ;1g folic acid; 50 mg biotin ; 300 g choline chloride; 50 g zinc; 4 g copper; 0.3 g iodine ; 30 g iron; 0.1 g selenium; 60g manganese ;0.1 g cobalt; and carrier $CaCO_3$ to 3000 g . 2- According to Feed Composition Tables for animal and poultry feedstuffs used in Egypt (2001). 3- Price of one kg (Egyptian pound / kg diet) for different ingredients: Yellow corn, 3.95; Soybean meal 8.0; Wheat bran, 2.42 ; Corn gluten, 13.8 ; Di-calcium phosphate, 10.8; Limestone, 0.2; Premix, 60.0; Salt, 0.50; Dl - methionine, 70.0; anise seeds, 40; 100 ml anise oil, 350

Serum biochemical:

At the end of research, samples of blood from individual chicks thought the slaughter were collected without anticoagulant. The serum was obtained from test tubes which displayed blood clot were centrifuged at 3500 rpm for 20 minutes. Sera were used for determination of serum total protein according to the method of Peters, (1968), total cholesterol, (Ellefson and Caraway, 1976), triglycerides (Bucolo and David, 1973), HDL, LDL cholesterol (Sawle *et al.,* 2002), AST and ALT enzymes (Reitman and Frankel, 1957).

Statistical analysis:

Statistically, data from the present study were analyzed using the General Linear Models Procedure of the SPSS (2008). The differences between treatments were identified by Duncan´s multiple range – test (Duncan, 1955). The following model was as follows:

$$Yij = \mu + Ti + eij$$

where:

Yij = an observation, μ = overall mean, Ti = effect of treatment (i=1, 2, 3, 4, 5, 6,7) and eij = Random error.

RESULTS AND DISCUSSION

The effect of dietary supplementation by different levels of anise oil (AO) anise seed powder (ASP) and their mixture to broiler chickens from 1 to 35 days of age and 1% turmeric (*Curcuma longa*) from 28 to 35 days (the last week of age) on live body weight (LBW) of broiler chickens is showed in Table 2. The results illustrated that there is no significant influence of dietary treatments on BW at 7, 14

and 28 days of age. However, significant differences were recorded among values of BW at one, 21 days and 35 days of age due to feeding diets enriched with anise oil (AO), anise seeds powder (ASP) and their mixture. Broilers fed the diets enriched with 45 ml / kg of AO displayed significantly higher (P< 0.05) LBW at 21 days of age than those of birds fed diets enriched with 90 mg AO plus 1.0 g ASP or 1.0 g ASP alone per kg diet but was comparable to those of the control and other experimental groups.

Table 2. Effect of dietary supplementation with anise oil, anise seed powder and their mixture supplementation on live body weight of broiler chickens

Days in treatments	control	Anise oil/kg diet		Anise seed powder /kg diet		Anise oil + anise seed powder /kg diet		SEM	Sig.
		45 mg	90 mg	1 g	2 g	22.5 mg + 0.5g	45mg + 1g		
1 day	44.0	47.1	47.1	44.6	45.4	45.4	45.7	0.40	NS
7	161.2	161.9	148. 8	152. 8	157.7	156.1	149.4	2.14	NS
15	387.3	384.1	356.3	348.6	385.9	374.1	351.6	5.27	NS
21	751.4^{ab}	787.5^{a}	700.9^{b}	686.4^{b}	726.6^{ab}	732.1^{ab}	681. 8^{b}	10.34	*
28	1191.1	1072.5	1061.8	1080.5	1184.5	1179.1	1086.3	18.06	NS
35	1710.1^{b}	1953.4^{a}	1703.6^{b}	1703.6^{b}	1791.8^{ab}	1773.0^{ab}	1707.9^{b}	28.43	*

a,b: means in the same row bearing different superscripts are significantly different (p≤0.05).
SEM=Standard error of the means. NS= Non-significant. *= Significant at P≤0.50.

In addition, birds fed the diet supplemented with 45 ml AO / kg diet had significantly (P<0.05) higher final LBW than those of the control and the other diets fortified with 90 ml AO or 1.0 g ASP / kg diet but did not differ from other experimental groups.

Response of weight gain of broiler chickens to feeding on diets supplemented with AO, ASP and their mixture from 1 to 35 days of age and supplementation with 1g Turmeric/kg diet from the day 28 of age till the end of study is shown in Table 3. It is clearly observed that after 3 weeks of consuming the experimental diets all experimental groups did not actually differ from control group in body weight gain (BWG) which ranged from 337.8 to 403.3 g / bird during the third week of age. However, during the fourth week of life, it was observed that chicks fed on diet supplemented with 45 mg AO/kg diet exhibited significantly lower (P≥0.05) weight gain than those produced by control and other dietary treatments, but the opposite is true during 29-35 days of age where the results confirmed the superiority of the group fed on the 45 mg AO/kg diet in BWG as it was significantly higher than all the control and other treatments. Also, the same trend was observed during overall period (1-35 days of age) where the birds fed diet supplemented with 45 mg AO/kg diet attained significantly higher (P≤0.05) BWG than those of the control and other treatments but did not differ from those of 2g ASP/kg diet or the diet supplemented with 0.5 g ASP + 22.5 mg/ kg diet.

Table 3. Effect of dietary supplementation with anise oil, anise seed powder and their mixture supplementation on body weight gain/bird of broiler chickens

Treatment Days	control	Anise oil/kg diet		Anise seed powder /kg diet		Anise oil + anise seed powder /kg diet		SEM	Sig.
		45 mg	90 mg	1 g	2 g	22.5 mg + 0.5g	45mg + 1g		
1-7	117.28	114.71	101.64	108.21	112.28	110.42	103.71	20.17	NS
7-14	226.03	222.25	207.46	195.78	228.17	217.96	202.17	4.17	NS
14-21	364.10	403.39	344.64	337.85	340.71	358.03	330.17	10.55	NS
21-28	439.64^{a}	285.00^{b}	360.89^{ab}	394.10^{ab}	458.03^{a}	446.96^{a}	404.46^{ab}	19.03	*
28-35	519.64^{b}	880.85^{a}	641.84^{b}	623.09^{b}	607.14^{b}	593.92^{b}	621.66^{b}	28.71	*
1-35	1666.7^{b}	1906.2^{a}	1656.5^{b}	1659.1^{b}	1746.4^{ab}	1727.3^{ab}	1662.2^{b}	28.37	*

a,b: means in the same row bearing different superscripts are significantly different (P≤ 0.05).
SEM=Standard error of the means. NS= Non-significant. *= Significant at P≤0.50.

Results of feed intake (FI) of broiler chickens feeding diets enriched with AO, ASP and their mixture (1-35 day) and supplementation 1 g turmeric/kg diet to broiler's diet during the fifth week study are shown in Table 4. The results illustrated that FI of broilers during the first week was significantly decreased (P≤0.05) due to feeding the supplemented diets with the exception the diet supplemented with 90 mg AO/kg diet, while no significant differences were detected among dietary treatments and the control diet during the second and third weeks of study.

Table 4. Effect of dietary supplementation with anise oil, anise seed powder and their mixture on weekly feed intake/bird/ and total period

Periods (d) in treatments	control	Anise oil/kg diet		Anise seed powder /kg diet		Anise oil + anise seed powder /kg diet		SEM	Sig.
		45 mg	90 mg	1 g	2 g	22.5 mg + 0.5g	45mg + 1g		
1-7	158.1^{a}	142.9^{abc}	152.0^{ab}	132.9^{bc}	136.4^{bc}	136.1^{bc}	127.5^{c}	2.92	*
7-14	368.2	392.3	384.1	355.7	401.1	373.2	354.1	6.52	NS
14-21	680.2	669.5	632.0	645.2	664.3	665.0	638.2	6.28	NS
21-28	519.1^{ab}	469.6^{a}	511.6^{ab}	514.5^{ab}	587.5^{a}	592.7^{a}	554.8^{ab}	13.42	*
28-35	1041.1^{b}	1273.7^{a}	999.4^{b}	1103.8^{b}	967.5^{b}	981.6^{b}	1010.4^{b}	24.43	*
1-35	2766.6^{b}	29480^{a}	2679.0^{b}	2752.0^{b}	2756.8^{b}	2748.6^{b}	2685.0^{b}	25.18	*

a,b,c: means in the same row bearing different superscripts are significantly different (P ≤ 0.05).
SEM=Standard error of the means. NS= Non-significant. *= Significant at P≤0.50.

After addition curcumin powder (1 g / kg diet) at 28 d of age, FI was significantly increased because of feeding on diet supplemented with 45 ml AO/kg diet during the last week of study (28-35d). It could be mentioned that weekly records of feed intake during the study period fluctuated from week to another and had no fixed trend, but the results indicated that dietary supplementation by two levels of ASP and combination between AO and ASP resulted in a slight

decrease in FI as compared to control and the diets contained 45 and 90 mg AO/kg diet during the whole experimental period.

Results concerning the FCR (kg feed/kg weight again) as influenced by feeding diets supplemented with AO, ASP and their combination from 1 to 35 day of age and supplementation with 1g Turmeric/kg diet during the last week of study are given in Table 5. The results raveled that diets fortified with the low level of AO (45mg/kg diet) and 2g ASP/kg diet and their mixture at different levels of led to insignificant (P≥0.05) improvement in FCR after one week of the study. But it is clearly observed that all treatments did not actually differ from the control group in the value of average FCR during the second, third and fourth weeks of study and the whole period of study except for the last week (28-35 d) where the birds fed diet supplemented with 45 or 90 mg AO /kg diet and 2g ASP/kg diet significantly recorded the best value of FCR as compared to the control diet.

Table 5. Effect of dietary supplementation with anise oil, anise seed powder and their mixture on weekly feed conversion and total ratio of broiler chickens

Periods (d) in treatments	control	Anise oil/kg diet		Anise seed powder /kg diet		Anise oil + anise seed powder /kg diet		SEM	Sig.
		45 mg	90 mg	1 g	2 g	22.5 mg + 0.5g	45mg + 1g		
1-7	1.34^{ab}	1.24^{b}	1.52^{a}	1.23^{b}	1.21^{b}	1.24^{b}	1.24^{b}	.03	*
7-14	1.62	1.77	1.84	1.84	1.75	1.71	1.76	.03	NS
14-21	1.86	1.68	1.83	2.11	1.97	1.86	1.94	.05	NS
21-28	1.18	1.73	1.42	1.61	1.28	1.32	1.37	.07	NS
28-35	2.03^{a}	1.54^{b}	1.56^{b}	1.78^{ab}	1.59^{b}	1.68^{ab}	1.64^{ab}	.05	*
1-35	1.66	1.56	1.62	1.66	1.57	1.59	1.62	.02	NS

a,b: means in the same row bearing different superscripts are significantly different (p ≤ 0.05).
SEM=Standard error of the means. NS= Non-significant. *= Significant at P≤0.50.

The results illustrated that the highest BW, BWG and FCR of broiler chickens were observed due to feeding the diet contained 45 mg AO/kg diet followed by the diet supplemented with 2 g ASP/ kg diet and the mixture between 22.5 mg AO + 0.5g ASP/kg diet, but regarding final live BW, this improvement was obtained after adding 1g turmeric/kg diet at 28 d of age suggesting synergistic effect between these doses from AO, ASP and Turmeric powder (TP). The exact reason for this improvement in productive performance is speculative. It may be due to many mechanisms; anise seeds contain 2-6% of essential oils, phenolic acids, eugenol, estragole, and trans-anethole which is a powerful phytoestrogen and the main component (80-95%) of the oil (Christaki *et al.,* 2011). Anise seed powder have antioxidant activity, alleviating stress or preventing peroxidation (fatty acids oxidation) and increase nutrient utilization thus it may induce a positive effect on digestibility of nutrients, and may increase the activities of pancreatic lipase and amylase (Al-Shammari 2011; Ertas *et al.,* 2005; Hernandez *et al.,* 2004). Moreover, this improvement may be due to the bioactive components of anise such as anethole of the anise which have digestive stimulating effect (Cabuk *et al.,* 2003). Besides, essential oils of the anise have antimicrobial impact (Dorman and Deans, 2000; Valero and Salmeron 2003), anticoccidial (Giannenas *et al.,* 2003) and antifungal (Pina-Vaz *et al.,* 2004) which maintain the health status of the gastrointestinal tract of the birds. Also, it is interesting to note that synergistic effect between AO, ASP and turmeric powder (TRP) was showed at the end of study, this findings were possibly associated with the active components in TRP where it has active ingredients such as curcumin and dimethoxy-curcumin, bisdemethoxy-curcumin (Wuthi-Udomler *et al.,* 2000), Curcumin has been studied extensively as a chemo preventive agent in several cancers (Duvoix *et al.,* 2005). Additionally, it has been suggested that curcumin possess hepatoprotective, antitumor, antiviral and anticancer activities (Polasa *et al.,* 1991) and it is used in gastrointestinal and respiratory disorders (Anwarul *et al.,* 2006).

The positive effect on productive performance of broiler chicks due to feeding the enriched diets treatments in present study is in agreement with results of studies in which different essential oils were added to poultry diets. In this regards, Ciftci *et al.* (2005), reported that anise oil supplementation in broiler feed improved both daily weight gain and FCR compared with the negative control but had no significant effect on feed intake.

In addition, our results are consistent with those reported by Safa, (2014) that LBW, BWG and FCR were significantly improved as the added dietary level of ASP was increased (0, 0.5, 0.75 and 1%). But Soltan *et al.,* (2008) showed that highest body gain was recorded in broiler chicks fed diet supplemented with 0.5 and 0.75 g AS/kg diet compared to the control, but higher inclusion rate (1.5 g/kg diet) of AS reduced body gain by about 2.9% when compared with the control group. Regarding TRP, similar result was found by Durrani *et al.* (2006); and Mondal *et al.* (2015), who reported that broilers that fed diet supplemented with 0.5% of TRP utilized their diets more efficiently. However, these findings contradict with results of Namagirilakshmi (2005) who stated that broilers fed on diets fortified with different levels of turmeric (0.25, 0.50, 0.75 or 1%) level did not show significant differences in body weight gain. Also, Yaghobfar *et al.* (2011) detected no significant effect of feeding TRP on FCR at the level of 0.4 and 0.8%.

Dietary AO, ASP and their mixture supplementation during the experimental study and addition turmeric from 28 to 35 day of age had no significant on all studied serum biochemical parameters with exception total protein, albumin, HDL, TAC and AST activities as shown in Table 6. As a rule, addition of anise oil at 90 mg/kg to the diets results in a significant decrees in serum total protein compared to control diet. Also, serum albumin was significantly lowered (P≤0.5) for birds fed diet supplemented with the two levels of AO and the mixture between 45 mg AO + 1g ASP/kg diet as compared with the control group. Moreover, the results found that supplementation of mixture between AO and ASP led to a decrease in serum HDL compared to the control diet. Regarding to total antioxidant capacity, it was significantly decreased for birds fed diet supplemented with 90 mg AO, 1g ASP or 2 g ASP/kg diet compared to those fed control and other experimental diets.

In respect of the effect of ASP on serum biochemical traits, anise seeds supplementation at 0.25 and 0.5 g/kg of broiler diet reduced serum levels of ALT and cholesterol

when compared with the control group (Tabanca *et al.*, 2003). It has already been reported that ASP supplementation at 0.25, 0.75, 1.0, and 1.5 g/kg diet showed no significant reduction in serum protein and albumin while 0.5, 1.0 and 1.5 g ASP/kg diet led to significantly decrease in serum globulin (Soltan *et al.*, 2008). Christaki *et al.* (2011), who found that total cholesterol and triglycerides (TG) serum levels were considerably lower in Japanese quails supplemented with ground anise seed at 10 or and 20 g/kg.

Table 6. Effect of dietary supplementation with anise oil, anise seed powder and their mixture supplementation on serum biochemical parameters of broiler chickens

Parameters	control	Anise oil/kg diet		Anise seed powder /kg diet		Anise oil + anise seed powder /kg diet		SEM	Sig.
		45 mg	90 mg	1 g	2 g	22.5 mg + 0.5g	45mg + 1g		
T.P (mg/dl)	5.55^{a}	4.15^{ab}	3.75^{b}	5.15^{ab}	5.00^{ab}	4.75^{ab}	4.55^{ab}	0.20	*
Al. (mg/dl)	2.45^{a}	1.65^{b}	1.55^{b}	2.10^{ab}	2.05^{ab}	1.90^{ab}	1.70^{b}	0.09	*
Globulin	3.10	2.50	2.20	3.05	2.95	2.85	2.85	0.12	NS
K. (mg/dl)	0.33	0.29	0.28	0.33	0.34	0.35	0.31	0.01	NS
GPT (U/L)	3.00	4.50	5.50	5.50	5.00	5.00	4.00	0.35	NS
GOT (U/L)	49.50^{ab}	44.50^{ab}	63.00^{a}	58.50^{ab}	66.00^{a}	37.50^{b}	56.50^{ab}	3.24	*
Ch. (mg/dl)	150.00	123.00	98.00	118.50	146.00	127.00	106.50	7.30	NS
T.G (mg/dl)	103.00	85.00	73.50	83.50	89.50	70.00	69.00	4.42	NS
LDL (mg/dl)	75.40	61.50	39.80	56.80	85.60	74.00	53.20	7.08	NS
HDL (mg/dl)	54.00^{a}	44.50^{ab}	43.50^{ab}	45.00^{ab}	42.50^{ab}	39.00^{b}	39.50^{b}	1.59	*
TAC (mm/l)	0.70^{a}	0.65^{ab}	0.59^{b}	0.60^{b}	0.59^{b}	0.71^{a}	0.67^{ab}	0.02	*

a,b: means in the same row bearing different superscripts are significantly different (p ≤ 0.05).
SEM=Standard error of the means. NS= Non-significant. *= Significant at P≤0.50.

Al-Shammari *et al.* (2017) stated that addition of anise seed powder to drinking water of broiler chickens resulted in significant reduction levels of total cholesterol, total lipids, triglycerides, as well as in AST and ALT activities when compared with the control group, while total protein, albumin, globulin, were significantly higher in the anise-fed groups (500, 750, and 1000 mg/L to the drinking water) compared with the control group. The properties of the anise seeds may positively affect the digestibility of nutrients and increase the activities of pancreatic lipase, and have antioxidant activity, which can prevent fatty acids oxidation, and increase nutrient utilization (Al-Shammari, 2011; Ertas *et al.*, 2005).

Effects of feeding on diets supplemented with different levels of AO, ASP and their mixture on carcass traits and some gut indexes of broiler chickens are presented in Table 7. No significant alternations were detected in most of carcass traits due to feeding the treated diets as compared to the control diet. But the carcass yield (%) was significantly increased (P≤0.5) due to feeding the diets enriched with the two level of AO (45 and 90 mg/kg diet) compared to the control diet. The birds fed control diet recorded significantly higher value of spleen % than those fed diet supplemented with 22.5 mg AO + 0.5 g ASP/kg diet. Significant differences were observed among dietary treatments in respect of bursa % where, bursa of birds fed diet supplemented with 22.5mg AO + 0.5g ASP/kg diet was significantly increased compared to those fed diet supplemented with 0.5 g ASP and 45 mg AO + 1g ASP/kg diet. In addition, the longest value of relative length of duodenum % were obtained from birds fed diet supplemented with 22.5 mg AO + 0.5 g ASP/kg diet and this effect was significantly as compared to the birds fed diet supplemented with 45 mg AO/kg diet. On the other hand, the relative length of jejunum (%) was significantly decreased due to feeding on diets supplemented with 45 mg and 90 mg AO/kg diet compared to the control diet.

Table 7. Effect of dietary supplementation with anise oil, anise seed powder and their mixture supplementation on carcass quality of broiler chickens

Treatment	control	Anise oil/kg diet		Anise seed powder /kg diet		Anise oil + anise seed powder /kg diet		SEM	Sig.
Traits		45 mg	90 mg	1 g	2 g	22.5 mg + 0.5g	45mg + 1g		
Live body weight (g)	1786.3	1952.5	1800.00	1897.50	1857.50	1798.75	1892.50	21.58	Ns
Carcass%	71.24^{b}	73.78^{a}	73.50^{a}	72.42^{ab}	73.04^{ab}	71.89^{ab}	73.24^{ab}	0.27	*
Liver %	2.17	1.98	1.88	2.10	1.81	2.01	2.05	0.05	NS
Gizzard %	1.53	1.54	1.60	1.57	1.48	1.59	1.38	0.02	NS
Heart%	0.34	0.36	0.33	0.31	0.33	0.33	0.31	0.005	NS
Spleen%	0.16^{a}	0.16^{a}	0.11^{ab}	0.16^{a}	0.12^{ab}	0.09^{b}	0.11^{ab}	0.008	*
Bursa%	0.07^{ab}	0.07^{ab}	0.07^{ab}	0.07^{ab}	0.05^{ab}	0.07^{a}	0.05^{b}	0.002	*
Abdominal fat %	0.84	.960	.820	.590	0.94	.820	.78	0.05	NS
Breast %	42.41	44.47	44.32	44.23	44.16	42.65	44.40	0.30	NS
Pancreas %	0.22	0.20	0.23	0.24	0.21	0.21	0.21	0.005	NS
Duodenum %	1.62^{abc}	1.43^{c}	1.62^{abc}	1.69^{ab}	1.80^{ab}	1.84^{a}	1.56^{bc}	0.03	*
Jejunum %	5.14^{a}	3.97^{b}	3.68^{b}	4.30^{ab}	4.42^{ab}	4.35^{ab}	4.32^{ab}	0.12	*
Ileum %	5.26^{a}	3.52^{b}	3.86^{b}	3.92^{b}	4.04^{b}	4.37^{ab}	4.26^{ab}	0.14	*
R. cecum %	1.05^{abc}	.97^{bc}	.92^{c}	1.00^{abc}	1.00^{abc}	1.11^{ab}	1.15^{a}	0.022	*
L. cecum %	1.00	.93	.90	.94	.96	1.05	1.06	0.020	NS

a,b,c: means in the same row bearing different superscripts are significantly different (p ≤ 0.05).
SEM=Standard error of the means. NS= Non-significant. *= Significant at P≤0.50.

Also, the different levels of AO and ASP resulted in a slight decrease in length of ileum % compared to the control diet. The right cecum % was slightly decreased in birds fed diet supplemented with 90 mg AO/kg diet as compared to those fed diet contained 45 mg AO + 1g ASP/kg diet.

The results showed that carcass yield (%) was improved due to feeding the diet fortified with the two level of AO (45 and 90 mg/kg diet) compared to the control diet. Also, Alcicek et al. (2003) reported that, adding essential oil in the ration led to positive effects on the carcass yield in

broilers. In respect of abdominal fat, similar result was obtained by Hamodi and AL-Khalani (2011) who found that inclusion of anise oil in broiler diets significantly (P≤0.05) decreased the abdominal fat percentage compared to both negative and positive control diets. Also, Ashan(2011) found that, the lowest percentage of abdominal fat was recorded by the diet supplemented by 200 ppm anise oil as compared to the control group. No significant differences of dietary treatments in the present study on liver, gizzard, and heart % was observed, however, Safa (2014) reported that the diets supplemented with anise oil significantly increased the liver and gizzard percentages compared to control diets.

According to Mondal *et al.* (2015) amount of abdominal fat was lowest in broilers fed 0.5% turmeric powder diet compared to control diet. Also, some other researchers (Nouzarian *et al.*, 2001), who reported lower fat content in broilers that fed diet containing 0.5% turmeric powder. However, results in the current study are in agreement with some studies which no significant effect of turmeric powder on the weight of internal organs (heart, liver and gizzard) of broilers fed turmeric (Mondal et al., 2015).

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أثر إضافة زيت الينسون، مسحوق بزور الينسون أو كلاهما خلال الفترة من الفقس وحتي 35يوم مع إضافة الكركم من عمر28 يوم علي الأداء الإنتاجي لدجاج إنتاج اللحم

فوزى صديق عبد الفتاح[1]، خليل الشحات شريف[1] ، ملاك منصور بشاره[2] و حافظ عوض الله حافظ[1]

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استخدم في هذا البحث عدد196 كتكوت Hubbard غير مجنس عمر يوم . تم وزن الكتاكيت وتوزيعها عشوائيا بناءا علي وزن الجسم الي 7 معاملات تجريبية ولكل معاملة 4 مكررات وذلك لدراسة تأثير اضافة مستويات مختلفة من زيت الينسون، بذور الينسون أوالخليط بينهما خلال الفترة من الفقس وحتي 35 يوم ثم إضافة الكركم خلال الأسبوع الأخير من الدراسة علي الأداء الإنتاجي وكمياء الدم وجودة الذبيحة الأداء الإقتصادي. تم تكوين عليقة إنتاج لحم بناءا علي توصيات NRC 1994. تحتوي علي مستويات متدرجة من زيت الينسون (45 و 90 مجم / كجم عليقة), و بذور الينسون (1و 2 جم / كجم عليقة) وكذلك الخليط بينهما (22.5 مجم+0.5جم و 45 مجم+1جم / كجم علف) وإضافة الكركم بمعدل 1 جم/ كجم عليقة خلال السبوع الأخير من البحث بينما العليقة المقارنة خالية من تلك الإضافات.وقد اوضحت النتائج أن العليقة المضاف اليها 45 مجم زيت الينسون /كجم عليقة ادت الي أعلي وزن حي بدرجة معنويه مقارنة بالعليقة المقارنة وباقي المعاملات التجريبية بإستثناء العليقة المضاف اليها جرام بذور التنسون والخليط من22.5مجم زيت الينسون+ 0.5جرام بذور الينسون / كجم عليقة. وجد أن الكتاكيت التي تم تغذيتها علي عليقة مضاف اليها 45 مجم زيت الينسون /كجم علقية ذات أعلي وزن مكتسب للجسم مقارنة بالعليقة المقارنة. أوضحت النتائج أن المستويات المختلفة من بذور الينسون وكذلك الخليط مابين بذور الينسون وزيت الينسون أدت الي انخفاض معنوي في العليقة المستهلكة مقارنة بالعليقة المقارنة والعلائق المحتوية علي 45 و90 مل زيت الينسون /كجم عليقة وذلك خلال الفترة الكلية للدراسة الحالية. أظهرت نتائج البحث أن كل المعاملات التجريبيى لم تؤثر بدرجة معنوية علي معامل التحويل الغذائي خلال معظم فترات البحث الحالي مقارنة بالعليقة المقارنة. لا توجد إختلافات معنوية في القياسات البيوكميائية بإستثناء البروتين الكلي والألبيومين واليبوبروتين عالي الكثافة ومضادات الأكسدة الكلية كنتيجة للمعاملات التجريبية المختلفة. أيضا لم يلاحظ أي إختلافات معنوية في معظم قياسات الذبيحة مقارنة بالعليقة المقارنة. ومع ذلك فقد وجد أن الذبيحة% ذاد معنويا بإضافة المستويان من زيت الينسون (45 و90 مجم /كجم عليقة) مقارنة بالعليقة المقارنة. من النتائج المتحصل عليها يمكن استنتاج أن زيت الينسون وبزور الينسون أو الخليط بينهما يمكن استخدامة كإضافة غذائية في علائق دجاج اللحم لتحسين الأداء الإنتاجي.