EFFECT OF ANISE OIL SUPPLEMENTATION ON THE PERFORMANCE OF NORFA CHICKS AND SOME BLOOD CONSTITUENTS

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SUMMARY

The objective of this research was to determine the effect of dietary Anise oil (AO) supplementation on Norfa chick's performance and some blood parameters during the period of 4 to 16 wks of age. A total of one hundred and twenty, unsexed Norfa chicks, four weeks old, were randomly divided into 4 treatments of 30 chicks and divided into 3 replicates of 10 chicks each in a completely randomized design. Treatment groups were as follows: T_1, control basal diet without supplementation, T_2, T_3 and T_4 represent the supplementation of AO at the levels of 100, 300 and 500 mg/kg diet, respectively. The experiment lasted for 16 weeks. Performance parameters, some blood parameters and economical efficiency were determined. Results showed that, the diet with 500 mg Anise oil / Kg diet had significantly ($P \leq 0.05$) heaviest body weight, body weight gain, highest feed intake and best feed conversion ratio. Total protein and globulin significantly increased in T_4 (500 mg AO/kg diet); moreover, lower total lipids and total cholesterol were also recorded for the same group.

It could be concluded from this study that supplementing Norfa chick diets with Anise oil have a beneficial effect on chick's performance and could be used as a growth promoter.

Keywords: *Anise oil, performance, blood constituents, Norfa chicks.*

INTRODUCTION

Poultry industry has moved to minimize the use of antibiotics as growth promoters in animal diets and growing pressure was done on livestock producers in many parts of the world to produce antibiotic free birds (Demir *et al.,* 2005). The replacement of antibiotic growth promoters with other safe and natural alternatives is a important objective for the poultry industry. Researchers are now focusing on alternatives to replace the antibiotics; for this, spices, plant extracts and herbs received increasing attentions.

Plants and their extracts have been used traditionally in the therapy of some diseases for a long time in the world, and they have a significant role in maintaining human health. Recently plants and some extracts especially essential oils were used in researches of broiler nutrition to test their effects on broiler performance. The effect of essential oils as pharmacists is widely known in human and animal use.

Essential oils (EOs) are mixture of fragrant and volatile compounds, which are usually originated from plant, and are named with the aromatic characteristics considering the origin of plant (Oyen and Dung, 1999). Certain essential oils are found to have antibacterial ability, and also exhibit antioxidant, anti-inflammatory, anti-carcinogenic, digestion stimulating, and hypo-lipidemic activities (Viuda-Martos *et al.,* 2010). Thus, some EOs can be used as growth promoters in animal production (Kirsti *et al.,* 2010).

Supplementing the dietary EO would stimulate the growth performance of broilers (Bampidis *et al,* 2005). Broiler diets supplemented with a mixture of laurel, oregano, sage, citrus and anise EO, or a mixture of some EO significantly improved feed conversion (Cabuk *et al.,* 2006a). Also, in a broiler trial that tested mixtures of oregano, cinnamon, cayenne pepper, thyme, and combination of organic acids and plant extracts in comparison to nutritive antibiotic avilamycin in broiler chickens showed that birds supplemented with plant extracts had higher body weight gain and increased feed consumption as compared to other groups (Rezaei–Moghadam *et al*., 2012). Madpouly *et al.* (2011) reported that supplementation of turmeric increased serum antioxidant levels and immune status of the birds.

Plant extracts and spices as single compound or as mixed preparations can play a role in supporting both performance and health status of animals (Alcicek *et al.,* 2004 and Cabuk *et al.,* 2006a).The inclusion of EO mixture (EOM consisted of six different essential oils derived from selected herbs: Oregano oil (Origanum sp.), laurel leaf oil (Laurus nobilis L.), sage leaf oil (Salvia triloba L.), myrtle leaf oil (Myrtus communis), fennel seeds oil (Foeniculum vulgare), and citrus peel oil (Citrus sp.) at a level of 24 mg/kg diet significantly improved egg production, feed efficiency and reduced the percentage of cracked/broken eggs (Cabuk *et al.,* 2006b). Essential oil mixture and organic acid supplementation in commercial layer diets under heat stress is beneficial to egg weight and immune function (Ozek *et al.,* 2011).

Anise (*Pimpinella anisum L.*), 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 seed is listed by the Council of Europe as natural source of feed flavoring and in the USA. It is considered as GRAS, i.e. Generally Recognized As Safe (Al-Beitawi *et al.,* 2009). Anise has been examined for its anti-parasitic and digestion stimulating properties (Cabuk *et al.,* 2003), as well as its antibacterial (Tabanca *et al.,* 2003), antifungal (Soliman and Badea, 2002), antipyretic (Afifi *et al.,* 1994), antioxidant (Gulcin *et al.,* 2003), antimicrobial (Al-Kassie, 2008), anti-helmintic (Bhatti *et al*., 1996) and hypo-cholesterolemic (Craig, 1999) activities. Additionally, anise is reported to possess anticonvulsant (Pourgholam *et al.,* 1999), antiepileptic (Janahmadi *et al.,* 2008) and muscle relaxant (Albuquerque *et al.,* 1995) properties. Some studies have been conducted to evaluate the use of anise seed or oil in poultry nutrition especially as growth promoters (Soltan *et al.,* 2008; Al-Beitawi *et al.,* 2009 and Ashan, 2011). Eltazi (2014) showed that, the diet with 400ppm anise oil had significantly heaviest body weight gain, highest feed intake, best feed conversion ratio, highest dressing percentage with highest percentages of commercial cuts (breast drumstick and thigh).

Many studies have shown positive effects of dietary essential oil on body weight. Supplementing the dietary essential oils (Cross *et al.,* 2007) stimulated the growth performance of broilers. Ocak *et al.* (2008) supplemented broiler diets with a mixture of herbal essential oils and found a significant reduction in feed intake. Essential oil mixture of 200 ppm of oregano, anise oil, clove, rosemary and turmeric plant have shown improvement in the growth performance of broilers (Al–Sultan, 2003) and (Zhang *et al.,* 2005).

This study was carried out to gain additional information about the effect of using dietary anise oil as a natural feed additive on productive performance, some blood parameters and economic efficiency of Norfa chicks from 4 – 16 weeks of age.

MATERIALS AND METHODS

The present study was conducted in the Poultry Research Farm and the Poultry Nutrition Laboratory, Faculty of Agriculture, Minufia University, Shebin El-kom. Experiment was carried out during June to August, 2015. A total of one hundred and twenty, unsexed Norfa chicks, four weeks old, were randomly divided into 4 treatments of 30 chicks and divided into 3 replicates of 10 chicks each in a completely randomized design. Feed and water were provided *ad libitum*. All proper husbandry practices were followed. Chicks were kept under similar conditions of managements throughout the experimental periods. Anise oil (*Pimpinella anisum*) was obtained from the local herbal market and then added to the experimental diets. Treatment groups were as follows: T_1, Control (basal diet without supplementation), T_2, T_3 and T_4 (the basal diet supplemented with anise oil at the levels of 100, 300 and 500 mg/kg diet, respectively).

All diets were formulated (Tables 1 and 2) to meet the nutrient requirements of Norfa chicks according to Zanaty and Ibrahim (2005). Chicks were weighed and feed intake was recorded weekly. Body weight, body weight gain and feed conversion ratio (FCR) were obtained. Economic efficiency was calculated.

At the end of the experiment (16 weeks of age), blood samples were collected from wing vein of three chicks from each replicate within each treatment in heparinized tubes and plasma was separated by centrifugation at 3500 rpm for 15 min and frozen at -20 °c for the determination of total protein, albumin, total lipids, total cholesterol, glucose, creatinine and transaminases (ALT and AST) which were calorimetrically determined using commercial kits. The globulin values were obtained by subtracting the values of albumin from the corresponding values of total protein (Coles, 1974); also albumin / globulin ratio (A/G ratio) was calculated.

The proximate analysis of feed (Tables 1 and 2) was determined according to the methods of (AOAC, 2011). The economic efficiency was calculated from the input – output analysis (Heady and Jensen, 1954) assuming that other head costs were constant, as follows: [(price of kg weight gain-feed cost /kg gain)/ feed cost /kg gain × 100] under local conditions. Data were statistically analyzed by the completely randomized design using the statistical software of SPSS 11.0 (2011) program and the differences among means were determined using Duncan's multiple range test (Duncan 1955). Percentages were transformed to the corresponding arcsine values before performing statistical analysis.

The following statistical model was applied:

$Y_{ij}=\mu + T_i + e_{ij}$

Where: Y_{ij} = an observation, μ = Overall mean. T_i = effect of treatment (i = control, 1, 2, 3) and e_{ij} = experimental random error.

Table (1). Composition and chemical analysis of the experimental Norfa chick diets fed during periods (4 - 8) weeks of age

Ingredients	Diets[1]				
	T_1 Control	T_2	T_3	T_4	Price / 1000 kg (LE)
Ground yellow corn (8.9%)	66.66	66.65	66.63	66.61	2800
Soybean meal (44%)	19.12	19.12	19.12	19.12	3870
Wheat bran	10..95	10..95	10.95	10.95	1500
Anise oil (AO)	-	0.01	0.03	0.05	4000
Limestone , ground	1.65	1.65	1.65	1.65	500
Di-calcium phosphate	0.95	0.95	0.95	0.95	1500
Vitamin and mineral mixture [2]	0.25	0.25	0.25	0.25	8300
L- Lysine	0.10	0.10	0.10	0.10	3000
DL-methionine[3]	0.07	0.07	0.07	0.07	3400
Sodium chloride (salt)	0.25	0.25	0.25	0.25	500
Total	100	100	100	100	–
Calculated values[4]:					
Crude protein ,%	16.04	16.04	16.04	16.04	–
ME, Kcal/kg diet	2805	2806	2807	2807	–
C/P ratio	175	175	175	175	–
Lysine,%	0.84	0.84	0.84	0.84	–
Methionine,%	0.33	0.33	0.33	0.33	–
Calcium,%	0.91	0.91	0.91	0.91	–
Av. phosphorus ,%	0.40	0.40	0.40	0.40	–
Determined Values:					
Dry matter, %	90.03	89.96	89.98	90.00	–
Crude protein, %	15..98	15..95	15..97	15..98	–
Ether extract, %	2.95	2.98	3.04	3.08	–
Crude fiber, %	3.74	3.76	3.78	3.78	–
Price / 1000 Kg (LE)[5]	2821	2881	2941	3021	

[1] T1; control; without supplementation, T2; control + 100mg Anise oil (AO) / Kg diet, T3, control + 300mg Anise oil (AO) / Kg diet; T4, control + 500mg Anise oil (AO) / Kg .

[2]Vitamin and Mineral mixture at 0.30%of the diet supplies the following per kilogram of the diet: vit.A, 1200 IU; Vit.D3, 2500 IU; Vit. E, 10 mg; Vit .K3, 3mg; Vit.B1, 1mg; Vit.B2, 4mg; pant othenic acid, 10 mg; Nicotinic acid, 20 mg; Folic- acid, 1 mg; Biotin, 0.05 mg; Niacin , 40 mg; Vit.B6, 3 mg, Vit. B12, 20 mcg; Choline Chloride, 400 mg; Mn, 62 mg; Fe, 44 mg; Zn, 56 mg; I, 1 mg; Cu, 5 mg and Se, 0.01mg.

[3]Dl-Methionine: 98% feed grade (contains 98% methionine).

[4]Calculated according to NRC (1994).

[5]Based on prices of Egyptian market, 6 / 2015.

Table (2). Composition and chemical analysis of the experimental Norfa chick diets fed during periods (8 - 16) weeks of age

Ingredients	Diets[1]				
	T_1 Control	T_2	T_3	T_4	Price / 1000 kg (LE)
Ground yellow corn (8.9%)	60.38	60.37	60.35	60..33	2800
Soybean meal (44%)	10.28	10.28	10.28	10.28	3870
Wheat bran	26.60	26.60	26.60	26.60	1500
Anise oil (AO)	-	0.01	0.03	0.05	4000
Limestone , ground	1.86	1.86	1.86	1.86	500
Di-calcium phosphate	0.14	0.14	0.14	0.14	1500
Vitamin and mineral mixture [2]	0.09	0.09	0.09	0.09	8300
L- Lysine	0.05	0.05	0.05	0.05	3000
DL-methionine[3]	0.25	0.25	0.25	0.25	3400
Sodium chloride (salt)	0.35	0.35	0.35	0.35	500
Total	100	100	100	100	–
Calculated values[4]					
Crude protein ,%	16.04	16.04	16.04	16.04	–
ME, Kcal/kg diet	2805	2806	2807	2807	–
C/P ratio	175	175	175	175	–
Lysine,%	0.84	0.84	0.84	0.84	–
Methionine,%	0.33	0.33	0.33	0.33	–
Calcium,%	0.91	0.91	0.91	0.91	–
Av. phosphorus ,%	0.40	0.40	0.40	0.40	–
Determined Values					
Dry matter, %	89..93	89..94	89.96	89.98	–
Crude protein, %	13.89	13.91	13.95	13.97	–
Ether extract, %	3.11	3.16	3.19	3.22	–
Crude fiber, %	3.98	3.98	4.03	4.05	–
Price / 1000 kg (LE)[5]	2517	2557	2637	2717	–

[1] T1; control; without supplementation, T2; control + 100mg Anise oil (AO) / Kg diet, T3, control + 300mg Anise oil (AO) / Kg diet; T4,5 control + 00mg Anise oil (AO) / Kg .

[2]Vitamin and Mineral mixture at 0.30%of the diet supplies the following per kilogram of the diet: vit.A, 1200 IU; Vit.D3, 2500 IU; Vit. E, 10 mg; Vit .K3, 3mg; Vit.B1, 1mg; Vit.B2, 4mg; pant othenic acid, 10 mg; Nicotinic acid, 20 mg; Folic- acid, 1 mg; Biotin, 0.05 mg; Niacin , 40 mg; Vit.B6, 3 mg, Vit. B12, 20 mcg; Choline Chloride, 400 mg; Mn, 62 mg; Fe, 44 mg; Zn, 56 mg; I, 1 mg; Cu, 5 mg and Se, 0.01mg.

[3]Dl-Methionine: 98% feed grade (contains 98% methionine).

[4]Calculated according to ***NRC (1994).***

[5]Based on prices of Egyptian market, 6 / 2015.

RESULTS and DISCUSSION

Growth Performance

The effect of feeding different levels of Anise oil (AO) on Norfa chick performance is shown in Tables (3 and 4). Final body weight, body weight gain, was significantly ($P \leq 0.05$) affected by the addition of anise oil to chick diets. At 16 weeks of age, the average body weight (BW) was significantly increased ($P \leq 0.05$) with the 500 mg AO/kg diet being; 1024.42g compared to other dietary treatments T_2, T_3 and T_1, control (949.46, 993.12 and 914.65g) in a respective order. Chicks consuming the control diet had a body weight gain (BWG) of 156.03 g in compression with 162.60, 168.00 and 174.84g for T_2, T_3 and T_4, respectively.

This may be attributed to Anise oil which contains some active items such as anathol (%85), eugenol, methylchavicol and anisaldehyde. Anathol and eugenol increase body weight gain and improve feed conversion by destroying the pathogen microorganism in digestive system, increasing production of digestive enzymes, improving utilization of digestive products and enhancing liver functions (Langhout, 2000; Williams and Losa, 2001; Cabuk, *et al.,* 2003; Hernandez *et al.,* 2004 and Osman *et al.,* 2005). In this study, the improved body weight in the 500mg AO/kg diet group may be due to these positive effects

of anise oil on digestive system. In agreement with these results, Simsek *et al.* (2007) and Eltazi (2014) stated that, the improved body weight with 400ppm of anise oil diet could be been due to positive effects of anise oil on digestive system.

Table (3). Effect of different levels of Anise oil (AO) on body weight and body weight gain of Norfa chicks during the experimental periods (Mean ± SE)

Periods	Dietary treatments[1]			
	T_1 Control	T_2	T_3	T_4
Body weights (g)				
IBW[2] (4Wk)	133.73 ±4.55	134.36± 5.28	133.66± 11.36	133.83±6.75
6Wk	191.43 ±3.59^{c}	197.00± 3.66^{c}	215.23±6.12^{b}	218.91±2.75^{a}
8Wk	317.96 ± 5.31^{c}	326.36±11.56^{ab}	349.54±9.15^{b}	357.91±9.46^{a}
10Wk	453.7 ± 17.10^{c}	466.36±4.51^{ab}	496.76±7.11^{b}	510.07±13.20^{a}
12Wk	601.62 ±13.25^{c}	621.39±11.12^{b}	656.12±19.13^{a}	676.69±8.55^{a}
14Wk	758.62 ±11.41^{d}	786.86±15.21^{c}	825.12±17.63^{b}	853.58±10.34^{a}
16Wk	914.65 ±9.76^{d}	949.46±12.32^{c}	993.12±18.89^{b}	1028.42±11.23^{a}
Body weight gain (g)				
4 – 6 Wk	57.7± 2.14^{c}	62.64±1.23^{b}	81.57±1.53^{a}	85.08±3.25^{a}
6 – 8 Wk	126.53±3.95^{c}	129.36±6.12^{ab}	134.31±2.84^{b}	139.00±1.10^{a}
8 – 10 Wk	135.74±2.76^{c}	140.00±3.25^{ab}	147.22±2.29^{b}	152.16±3.33^{a}
10 – 12 Wk	147.92±1.90^{c}	155.03±1.28^{ab}	159.36±4.40^{b}	166.62±1.11^{a}
12 – 14 Wk	157.00±2.22^{c}	165.47±1.22^{ab}	169.00±3.49^{b}	176.89±2.12^{a}
14 – 16 Wk	156.03±2.36^{c}	162.60±3.00^{ab}	168.00±.89^{b}	174.84±1.33^{a}
4 – 16 Wk	780.92±6.10^{c}	815.10±3.27^{ab}	859.46±2.14^{b}	894.84±4.95^{a}

[1] T_1, control; without supplementation, T_2; control + 100mg Anise oil (AO) / Kg diet, T_3, control + 300mg Anise oil (AO) / Kg diet; T_4, control + 500mg Anise oil (AO) / Kg .
[2] Intinal body weight.
[3] means ± SE of 3 replicates / treatment.

Table (4). Effect of different levels of Anise oil (AO) on feed intake and feed conversion of Norfa chicks during the experimental periods (Mean ± SE)

Periods	Dietary treatments[1]			
	T_1 Control	T_2	T_3	T_4
Feed intake, FI (g/bird)				
4–6 wk	144.25 ± 8.33^{d}	155.35± 6.23^{c}	199.85± 5.11^{b}	205.89± 10.32^{a}
6–8 wk	325.18±2.36^{c}	328.57± 11.00^{bc}	333.09± 1.29^{b}	339.16±2.20^{a}
8–10 wk	403.15± 1.95^{b}	406.00±5.55^{b}	413.69± 5.21^{a}	418.44±3.26^{a}
10–12 wk	470.39±1.12^{bc}	488.34± 1.52^{c}	498.80± 4.31^{b}	504.86±2.22^{a}
12–14 wk	543.22±3.30^{bc}	552.84±9.21^{c}	549.25±1.02^{b}	566.05±1.54^{a}
14–16 wk	596.03±2.68^{d}	614.62±3.10^{c}	621.60±2.21^{b}	636.42±1.09^{a}
4–16 wk	2912.83±10.11^{d}	2983.27±6.65^{c}	3059.68±8.64^{b}	3131.07±4.59^{a}
Feed conversion, FC (g feed/ g gain)				
4–6 wk	2.50± 0.06^{c}	2.48±0.04^{b}	2.45± 0.03^{b}	2.42±0.04^{a}
6–8 wk	2.57± 0.03^{c}	2.54±0.06^{c}	2.48± 0.01^{b}	2.44± 0.02^{a}
8–10 wk	2.97± 0.04^{c}	2.90±0.06^{c}	2.81± 0.04^{b}	2.75±0.04^{a}
10–12 wk	3.18± 0.01^{c}	3.15±0.02^{ab}	3.13± 0.01^{b}	3.03± 0.04^{a}
12–14 wk	3.46±0.06^{bc}	3.40±0.05^{c}	3.25±0.01^{b}	3.20±0.02^{a}
14–16wk	3.82±0.05^{c}	3.78±0.03^{ab}	3.70±0.04^{b}	3.64±0.06^{a}
4–16 wk	3.73±0.05^{d}	3.66±0.04^{c}	3.56±0.04^{a}	3.50±0.05^{a}

[1] T_1; control; without supplementation, T_2; control + 100mg Anise oil (AO) / Kg diet, T_3, control + 300mg Anise oil (AO) / Kg diet; T_4, control + 500mg Anise oil (AO) / kg.
[2] means ± S.E. of 3 replicates / treatment.

In addition, Hernandez *et al.* (2004) reported that supplementation of essential oil extract from oregano, cinnamon and pepper improved apparent whole tract and ileac digestibility of the nutrients in broilers. The result was agreement with the findings of Jang *et al.* (2004) who showed that supplementation of a blend of commercial essential oils combined with lactic acid increased trypsin and

pancreatic amylase activity in broiler. The results coincided with the findings of Ertas *et al.* (2005) who reported that the addition of essential oils mixture (oregano, clove and anise) in the diet improved body weight of broilers. In addition, positive effects of dietary essential oils on body weight were observed by Alcicek *et al.* (2003) and Denli *et al.* (2004). Moreover, Jamroz *et al.* (2003) found that the inclusion of 150 or 300 mg/kg of a plant extract containing capsaicin, carvacrol and cinnamicaldehyde in the diet improved body weight by 5.4 and 8.1%, respectively. In contrast, Botsoglou *et al.* (2004) reported that the supplementation of essential oils (oregano and rosemary essential oil) to a diet had no beneficial effect on body weight. Similar result was observed by Jamroz *et al.* (2005) who noted that a plant extract included in a broiler diet did not improve body weight. The diets with 150 and 250 ppm anise oil significantly ($P \leq 0.05$) showed lower body weight and body weight gain compared to the positive control diet.

The results showed that chicks fed supplemented diets significantly consumed more amount of feed compared to the chicks fed control diet (Table 4). The diet with 500mg/kg diet significantly ($P \leq 0.05$) recorded the highest feed intake (3131.07kg) in compression with other experimental diets control, $T_2$and T_3, (2912.83, 2983 and 3059.68Kg), respectively. The diet with 500mg/kg anise oil significantly ($P \leq 0.05$) recorded better feed conversion ratio (3.5) compared to other experimental diets and control (3.66, 3.56 and 3.73), respectively. The obtained results confirmed the previous findings of several researches (Simsek *et al.*, 2007 and Eltazi, 2014) who reported that the diet with 400 ppm anise oil significantly ($P \leq 0.05$) had the highest feed intake compared to other experimental diets. This increase feed intake may be attributed to the appetizing effect of active ingredient, such as anethol in anise (Cabuk *et al.*, 2003). Similar result was obtained by Ertas *et al.* (2005) who reported that the addition of essential oil mixture (oregano, clove and Anise) in the diet increased the feed intake of broilers. In contrast, Lee *et al.* (2003); Botsoglou *et al.* (2004) and Hernandez *et al.* (2004) reported that addition of plant extracts or essential oils (essential oil extract (EOE) from oregano, cinnamon, and pepper; and Labiatae extract (LE) from sage, thyme, and rosemary) to the diet had no effect on feed intake.

The improvement in feed conversion ratio in the diet at a level of 400ppm could be related to the digestive stimulating effect of anise (Cabuk *et al.*, 2003), particularly the digestion of protein and fat (Jamroz and Kamel, 2002). In addition, several researchers reported that anise oil significantly improved the feed conversion ratio of broiler chickens (Ather, 2000; Williams and Losa, 2001 and Giannenas *et al.*, 2003).

Blood constituents

Results of blood constituents as affected by different levels of anise oil are summarized in Table 5. It is clear that chicks fed 500mg AO/kg diet (T_4) had the highest values of total protein, albumin and globulin concentrations compared to other dietary treatments. Nevertheless, feeding Norfa chicks 300 or 500 mg AO/kg diet (T_3 and T_4) reduced the values of total lipids, glucose and total cholesterol in comparison with those fed the control or 100mg AO/kg diet (T_2). There were no adverse effects on blood components representing liver function (as measured by ALT and AST) or kidneys functions (as measured by creatinine levels). Results reported herein are in agreement with previous findings of Al-Mashhadani, *et al*. (2011) who stated that there was a decrease in plasma cholesterol and glucose for chicks fed diets contained anise oil. Lemhadri (2004) reported that an equeous organo extract exhibited an anti-hyperglycemic activity in rats without affecting basal plasma glucose concentration. On the other hand, Ashan (2011) found that anise oil supplementation had no adverse effects on blood biochemical parameters.

Economic efficiency

The economic efficiency of the experimental treatments (Table 6) indicates that the highest economic and relative economic efficiency values were obtained with the diet supplemented with graded levels of AO as a natural additive. It may be due to better feed conversion of birds received the experimental diets. El-tazi (2014) indicated that the economic evaluation of the diet supplemented with 400ppm level of anise oil showed the highest profitability ratio (1.8). This may be related to the higher return of the weight gains recorded in this group of chicks compared to other treatments.

CONCLUSION

It could be concluded from this study that supplementing Norfa chick diets with the level of 500ppm of the Anise oil (AO) has a beneficial effect on chick's performance and could be recommended to be used as growth promoters.

Table (5). Effect of supplemental Anise oil (AO) on some blood plasma constituents of Norfa chicks at 16 weeks of age

Item	Dietary treatments[1]			
	T_1 Control	T_2	T_3	T_4
Total protein (g/dI)	4.12±0.04^{c}	4.19±0.03^{b}	4.23±0.04^{a}	4.31±0.05^{a}
Albumin (A) (g/dl)	2.28±0.01^{ab}	2.32±0.02^{b}	2.35±0.02^{b}	2. 41±0.04^{a}
Globulin (g) (g/dl)	1.74±0.04^{c}	1.83±0.02^{b}	1.90±0.04^{a}	1.98±0.04^{a}
A / G ratio	1.31±0.02^{a}	1.26±0.02^{a}	1.24±0.01^{b}	1.22±0.02^{b}
Total lipids, mg/dl	510.13±0.02^{a}	482.61±0.01^{b}	452.00±0.03^{c}	428.56±0.0^{d}
Total cholesterol (mg/dl)	146.13±0.03^{a}	142.87±0.04^{b}	135.97±0.03^{b}	131.42±0.01^{c}
Glucose (mg/dI)	189.36±0.03^{a}	181.54±0.02^{b}	167.60±0.03^{c}	143.20±0.0^{d}
Creatinine (mg/dl)	1.42±0.02^{a}	1.35±0.01^{b}	1.37±0.01^{b}	1.40±0.01^{a}
ALT (U/L)	145.00±0.02^{b}	146.12±0.02^{a}	145.06±0.02^{a}	147.20±0.01^{a}
AST (U/L)	38.96±0.02^{c}	39.10±0.02^{b}	39.19±0.01^{b}	39.31±0.03^{a}

[1] T_1; control; without supplementation, T_2; control + 100mg Anise oil (AO) / Kg diet, T_3, control + 300mg Anise oil (AO) / Kg diet; T_4, control + 500mg Anise oil (AO) / kg.

[2] means ± S.E. of 3 replicates / treatment.

Table (6). The economic efficiency of the experimental diets of Norfa chicks fed during from (8 – 16 weeks of age)

Item	Dietary treatments[1]			
	T_1 Control	T_2	T_3	T_4
Body weight gain(g)	597	623	644	671
Total revenue (L.E) [1]	8.36	8.72	9.02	9.39
Feed intake (Kg)	2.18	2.22	2.25	2.23
Price of Kg feed (L.E)	2.52	2.56	2.64	2.72
Feed cost (L.E)	5.49	5.68	5.84	6.06
Net revenue (L.E)[2]	2.87	3.04	3.18	3.33
Economic efficiency, (%)	52.28	53.52	54.45	54.95
Economic efficiency relative (%)	100	102.37	104.15	105.11

[1] T_1 ,control; without supplementation, T_2; control + 100mg Anise oil (AO) / Kg diet, T_3, control + 300mg Anise oil (AO) / Kg diet; T_4, control + 500mg Anise oil (AO) / Kg.

- Assuming the price of one – Kg live body weight was 15E (according to Egyptian market, 6 / 2015).

[1] Total revenue = Body weight gain (Kg) x Price of one – Kg live body weight.

[2] Net revenue = Total revenue – Feed cost.

[3] Economical efficiency = (Net revenue / Feed cost) x 100.

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تأثير اضافة زيت الينسون فى علائق كتاكيت النورفا على الأداء الإنتاجى وبعض صفات الدم

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أجريت هذه التجربة لدراسة تأثير إضافة زيت الينسون على الأداء الإنتاجى وبعض صفات الدم لكتاكيت النورفا . استخدم فى هذه الدراسة عدد 120 كتكوت نورفا غير مجنس عمر اربعة أسابيع, تم تقسيمها عشوائياً إلى 4 معاملات تجريبيه, قسمت كل معاملة إلى 3 مكررات بكل منها 10كتاكيت. غذيت كتاكيت المعاملة الأولى (الكنترول) على العليقة الأساسية بدون إضافة بينما غذيت كتاكيت المعاملة الثانية والثالثة والرابعة على العليقة الأساسية مضافا اليها زيت اليانسون بمستويات 100 و 300 و500 ملجم / كجم عليقة على التوالى. وانتهت التجربة عند عمر 16 أسبوع وتم تقدير الأداء الإنتاجى للطيور وبعض صفات الدم والكفاءة الإقتصادية.

- أظهرت النتائج أن أعلى المتوسطات بالنسبة لوزن الجسم الحى ومعدل الزيادة فى وزن الجسم و التحسن فى معدل تحويل الغذاء معنوياً فى المجموعات الأساسية المضاف لها زيت اليانسون بمستوى 500ملجم / كجم عليقة . كما لوحظ أن الاضافة عند مستوى 500ملجم / كجم عليقة من زيت الينسون (المعاملة الرابعة) أدت إلى زيادة تركيز كل من البروتين الكلى, والألبيومين والجلوبيولين معنوياً بينما انخفض مستوى الدهون الكلية والكوليسترول فى بلازما الدم بالمقارنة بالكنترول. وتحسن الكفاءة الاقتصادية عند مستوى 500 ملجم زيت الينسون / كجم عليقة.

بناءً على النتائج المتحصل عليها من التجربة يتضح أن اضافة زيت الينسون بمستوى500 ملجم / كجم عليقة الى علائق كتاكيت النورفا أدى الى تحسن فى الأداء الانتاجى و بعض صفات الدم خلال الفترة من (4 إلى 16 أسبوع من العمر) تحت ظروف التجربة.