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The Effect of Anise Oil (*Pimpinella anisum L*.) On Broiler Performance

Mehmet Ciftci[1], Talat Güler, Bestami Dalkiliç and O. Nihat Ertas
Department of Animal Nutrition, Faculty of Veterinary Medicine, University of Firat, 23119 Elazig, Turkey

Abstract: This study was conducted to determine the use of anise oil in broiler nutrition as a natural growth promoting substance instead of antibiotics. Different levels of anise oil were added to a standard diet, to determine its effect on feed intake, daily live weight gain and feed conversion ratio compared to control and antibiotic groups. Two hundred day-old broilers (Ross-308) were divided into groups of 40 birds each and randomly assigned to the five treatment diets. Each treatment has four replicates. Experimental groups were as follow: A Control group with no anise oil or antibiotic added, a 100 mg/kg Anise oil group, a 200 mg/kg Anise oil group, a 400 mg/kg Anise oil group with corresponding inclusion levels, and an antibiotic group with 0.1% added antibiotic (Avilamycin). The feed intake was similar in groups ($p>0.05$). The highest ($p<0.01$) daily live weight gain was observed on the 400 Anise oil group (70.35 g) and followed by Antibiotic group (65.84 g), 100 Anise oil group (62.57g), 200 Anise oil group (62.47 g) and control group (61.30 g). The addition of 400 mg/kg anise oil to the diets was improved daily live weight gain by approximately 15% compared to the control group. This improve was remained 7 % level in antibiotic group. Additionally, the addition of 400 mg/kg anise oil to the diets was improved daily live weight gain by approximately 6.5% compared to the antibiotic group. The addition of 400 mg/kg anise oil to the diets was improved feed conversion ratio by approximately 12 % compared to the control group. This improve was remained 7 % level in antibiotic group. Additionally, the addition of 400 mg/kg anise oil to the diets was improved feed conversion ratio by approximately 6 % compared to the antibiotic group. 7. In conclusion, anise oil could be considered as a potential natural growth promoter for poultry.

Key words: Anise oil, antibiotic, performance, broiler

Introduction

Herbs have been used as food and for medicinal purposes for centuries. The World Health Organization estimated that .80% of the earth's inhabitants rely on traditional medicine for their primary health care needs, and most of this therapy involves the use of plant extracts or their active components. Those plants and their components are perceived as “natural” and “safe” by consumers. Such compounds are already established as flavorings in human and animal feeds; however, we now understand that certain materials also have added technical benefits that may be exploited to maintain animal performance.

After the use of most antibiotic growth promoters as feed additives has been banned by the European Union due to cross-resistance against pathogens and residues in tissues, scientists have searched for alternatives to antibiotics. In this view, aromatic plants and essential oils extracted from these plants are becoming more important due to their antimicrobial effects and the stimulating effect on animal digestive systems. Aromatic plants have been used traditionally in the therapy of some diseases for a long time in the world. Essential oils in these plants are used extensively in medicine and in the food and cosmetic industries. In different herbs, a wide variety of active phytochemicals, including the flavonoids, terpenoids, lignans, sulfides, polyphenolics, carotenoids, coumarins, saponins, plant sterols, curcumins, and phthalides have been identified (Craig, 1999). Research interest has focused on various herbs that possess hypolipidemic, antiplatelet, antitumor, or immune-stimulating properties that may be useful adjuncts in helping reduce the risk of cardiovascular disease and cancer. In addition to their antimicrobial activity (Singh *et al.,* 2002; Elgayyar *et al.,* 2001; Valero and Salmeron, 2003), they posses biological activities such as that of antioxidants (Lopez-Bote *et al.,* 1998; Chithra and Leelamma, 1999; Botsoglou *et al.,* 2002; Miura *et al.,* 2002) and as hypocholesterolemics (Craig, 1999), and stimulate effect on animal digestive systems (Jamroz and Kamel, 2002; Ramakrishna *et al.*, 2003) , to increase production of digestive enzymes and improve utilization of digestive products through enhanced liver functions (Langhout, 2000; Williams and Losa, 2001; Hernandez *et al.,* 2004). In limited research, some aromatic plants and their components on the performance, the addition of these substances to the feeds and water improved feed intake, feed conversion ratio and carcass yield (Alçiçek *et al.,* 2003; Bassett, 2000; Hertrampt, 2001; Tucker, 2002).

As an aromatic plant, anise (*Pimpinella anisum L*.) is an annual herb indigenous to Iran, India, Turkey and many other warm regions in the world. Anise oil has *anothole* (85 %) as active ingredient and also it has contained

Table 1: Composition of standard diets, %

FeedsIngredients	0 to 7	7 to 14	14 to 21	21 to 28	>28
Corn	49.31	55.08	42.41	47.24	45.49
Wheat	-	-	20.00	20.00	20.00
Soybean meal (44 CP)	25.00	25.00	25.00	1.54	12.20
Full fat Soybean	12.05	10.57	1.55	17.50	10.00
Vegetable oil	0.90	0.63	1.12	1.25	2.47
Fish meal	10.00	5.62	7.00	10.00	7.40
Dicalcium Phosphate	0.46	1.08	0.93	0.58	0.44
Ground Limestone	1.13	0.89	0.90	0.80	0.92
$NaHCO_3$	0.20	0.20	0.20	0.20	0.20
Salt	0.20	0.11	0.06	0.06	0.06
DL-Methionine	0.15	0.22	0.23	0.23	0.25
L-Lysine	0.05	0.05	0.05	0.05	0.02
Choline	0.05	0.05	0.05	0.05	0.05
Vitamin Premix *	0.25	0.25	0.25	0.25	0.25
Mineral Premix**	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Analysis					
Dry matter	88.25	88.32	88.41	88.31	88.50
Crude protein	27.0	24.5	22.50	20.50	20.0
Crude fiber	3.46	3.48	3.27	2.83	3.01
Ash	6.61	6.54	6.35	5.69	6.08
Ether Extract	4.84	4.56	4.01	6.57	6.41
Ca	1.09	1.00	1.00	0.96	1.00
P	0.5	0.50	0.50	0.50	0.50
Methionine	0.64	0.65	0.66	0.65	0.65
Lysine	1.57	1.34	1.25	1.05	1.08
ME, Mcal/kg	3.0	3.0	3.1	3.25	3.25

*Vitamin Premix (Rovimix 124/V) supplied per 1 kg: vitamin A, 7 500 IU; cholecalciferol, 1 500 IU; vitamin E, 7 500 IU; menadione, 1.25 mg; vitamin B1, 0.5 mg; vitamin B2, 5 mg; niacin, 35 mg; d-pantothenic acid, 10 mg; vitaminB12, 0.1 mg; folic acid, 1 mg; biotin, 50 mg. ** Mineral Premix (Remineral CH) supplied per 1 kg: Mn, 40 mg; Fe, 12.5 mg; Zn, 25 mg; Cu, 3.5 mg; iodine, 0.15 mg; Se, 0.75 mg; cholinchloride, 175 mg.

eugenol, methylchavicol, anisaldehyde and *estragole*. As a medicinal plant, anise has been used as a stimulating effect of digestion and antiparasitic (Çabuk *et al.,* 2003) antibacterial (Singh *et al.,* 2002; Tabanca *et al.,* 2003), antifungal (Soliman and Badea, 2002) and antipyretic (Afifi *et al.,* 1994). Additionally, the plant and especially its fruit essential oil have been used for treatment of some disease including seizures and epilepsy (Avicenna, 1988; Abdul-Ghani *et al.,* 1987). Furthermore, it has been shown to have anticonvulsant effects and has been used for the treatment of constipation (Curtis *et al.,* 1996; Pourgholam *et al.,* 1999; Chicouri and Chicouri, 2000) and possesses muscle relaxant effect (Albuquerque *et al.,* 1995).

Very few, if any, performance in animal studies has been conducted on anise oil. In this study, we aimed the use of anise oil in animal nutrition as a natural growth promoting substance instead of antibiotics. For this purpose, the different level of anise oil were added in standard diet, and studied to determine of effect on performance compared to control and antibiotic groups.

Materials and Methods

Two hundred day-old broilers (Ross-308) were divided into five treatment groups of 40 birds each and randomly assigned to the five treatment diets. Each treatment group was further sub-divided into four replicates of 10 birds per replicate. The presence and levels of anise oil and antibiotic in diets were the main factors tested. In the control group the birds were fed a standard diet (20-27% CP and 3.0-3.25 MCal ME/kg) (Control group). Three different levels of anise oil (87.5-90% purity) (Özdrog Co., Hatay, TURKEY) or an antibiotic (Avilamycin, Kartal Kimya, TURKEY) were added to the standard diets to generate the other four treatment groups. For the anise oil treatments, 100 mg/kg (100 Anise oil group), 200 mg/kg (200 Anise oil group), and 400 mg/kg (400 Anise oil group) anise oil were added to the standard diets. In the antibiotic treatment, the feed contained 0.1% (10 mg/kg) antibiotic. Vegetable oil was used as fat source. Anise oil was dissolved in vegetable oil and than gently mixed with the standard diets to arrive vegetable oil and 100 mg/kg, 200 mg/kg, and 400 mg/kg

Table 2: The effect of increasing dietary amounts of anise oil and antibiotic on the daily feed intake of broilers (g/bird/day) (n:4)

		Anise oil, mg/kg				
Weeks	Control	100	200	400	Antibiotic	P
1	41.86	42.11	41.63	41.27	41.77	NS
2	72.62	70.21	71.01	71.91	72.05	NS
3	93.69	93.52	93.73	95.45	94.99	NS
4	132.19	131.70	132.97	132.65	132.69	NS
5	152.46	152.93	153.43	154.37	152.39	NS
0-5	98.56	98.09	98.55	99.13	98.78	NS

NS: Non significant.

of additives in the diet. Antibiotic were mixed in a carefully to the standard diet. The diets were prepared freshly each day. Hydro distillation was used to extract the essential oils. The diets were prepared isocaloric and isonitrogenous. The ingredient and chemical composition of the diets are presented in Table 1. The fresh diets and water were provided *ad libitum*.

Ten broilers were kept in 20 pens (1.5 x 1.5 m) ventilated broiler house containing straw as litter material. A photoperiod of 24 h/d in 4 week and 14 h/d in 4-6 was maintained. The birds were housed together first 5 d. The body weights of the birds were measured at 5, 12, 19, 26, 33 and 40th days of the experiment. Feed intake was recorded biweekly. Feed conversions ratio was calculated at the end of the 40 day experimental period. There was no mortality in any group during the trial.

Chemical composition of feed ingredients (dry matter, crude protein, ash and ether extract) as dried samples were analyzed using AOAC (1990) procedures, and crude fiber was determined by the methods of Crampton and Maynard (1983).

Data collected were subjected to analysis of variance, and where significant differences were observed, means were further subjected to Duncan's multiple range test, SPSS for Windows: 10.1, SPSS inc., (1999). The results were considered as significant when p values were less than 0.05 and 0.01.

Results and Discussion

The effect of anise oil and antibiotic on the feed intake is presented in Table 2. From 1-5 weeks feed intake similar between groups. The addition of anise oil and antibiotic to the diets were not affected feed intake statistically ($p>0.05$).

The effect of anise oil and antibiotic on daily live weight gain is presented in Table 3. At the end of the 5 week, daily live weight gains differed ($p<0.05$) between treatments. The highest live weight gain was determined in 400 Anise oil group (70.35 g), this following the antibiotic group (65.84 g), 100 Anise oil group (62.57 g)and 200 Anise oil group (62.47 g), and control group (61.30 g) respectively ($P<0.05$). The live weight gains of birds fed the diets containing 100 and 200 mg/kg anise oil were lower than those of the birds on the diet containing 400 mg/kg anise oil ($p<0.05$). The addition of 400 mg/kg anise oil to the diets was improved daily live weight gain by approximately 15 % compared to the control group. This improve was remained 7 % level in antibiotic group. Additionally, the addition of 400 mg/kg anise oil to the diets was improved daily live weight gain by approximately 6.5 % compared to the antibiotic group.

The effect of anise oil and antibiotic on feed conversion ratio is presented in Table 4. From weeks 1 to 5, feed conversion ratios were differed significantly in groups ($p<0.05$). The addition of 400 mg/kg anise oil to the diets was improved feed conversion ratio by approximately 12% compared to the control group. This improve was remained 7% level in antibiotic group. Additionally, the addition of 400 mg/kg anise oil to the diets was improved feed conversion ratio by approximately 6 % compared to the antibiotic group.

As shown, daily live weight gain and feed conversion ratio were increased statistically in 400 Anise oil group compared to the control and antibiotic groups. These differences among the groups may be due to active ingredient such as *anothole, eugenol, methylchavicol, anisaldehyde* and *estragole* in anise. Because, especially *anothole* and *eugenol* have digestive stimulating effects (Çabuk *et al*., 2003). Besides, *anothole* affected pathogen microorganism in the digestive system and showed increasing effect on live weight gain and feed conversion. In many studies reported that essential oil derived from anise has antimicrobial (Singh *et al.,* 2002; Tabanca *et al.,* 2003), and antifungal (Soliman and Badea, 2002). Additionally, anise has been used as an antiparasitic (Çabuk *et al.,* 2003) and antipyretic (Afifi *et al.,* 1994). The improved feed utilization with 400 mg/kg anise oil in our study could be due to these positive effects of anise oil on the digestive system. Similarly, reported that essential oils were affected positively digestibility of nutrient. Studies showed that, essential oils increased digestion of protein, cellulose and fat (Jamroz and Kamel, 2002), improved apparent whole-tract and ileal digestibility of the nutrients (Hernandez *et al.,* 2004) and increased effects of pancreatic lipase and amylase (Ramakrishna

Table 3: The effect of increasing dietary amounts of anise oil and antibiotic on the daily live weight gain of broilers (g/bird/day) (n: 40)

		Anise oil, mg/kg				
Weeks	Control	100	200	400	Antibiotic	P
1	31.41	32.17	31.77	32.95	32.69	NS
2	50.48^{c}	52.49^{bc}	53.88^{bc}	58.17^{a}	55.60^{b}	*
3	70.93^{c}	72.59^{c}	72.03^{c}	84.00^{a}	78.08^{b}	**
4	78.56^{c}	79.78^{c}	80.53^{c}	90.60^{a}	83.52^{b}	**
5	75.12^{c}	75.80^{c}	74.13^{c}	86.02^{a}	79.32^{b}	**
0-5	61.30^{c}	62.57^{c}	62.47^{c}	70.35^{a}	65.84^{b}	**

NS: Non significant, *: P<0.05, **: P<0.01, ^{a,b,c}: Mean values with different superscripts within a row differ significantly.

Table 4: The effect of increasing dietary amounts of anise oil and antibiotic on the feed conversion ratio g feed/g gain, (n: 4)

		Anise oil, mg/kg				
Weeks	Control	100	200	400	Antibiotic	P
1	1.33^{a}	1.31^{b}	1.31^{b}	1.25^{d}	1.28^{c}	*
2	1.44^{a}	1.34^{b}	1.32^{b}	1.24^{c}	1.30^{b}	*
3	1.32^{a}	1.29^{a}	1.30^{a}	1.14^{c}	1.22^{b}	*
4	1.68^{a}	1.65^{a}	1.65^{a}	1.46^{c}	1.59^{b}	*
5	2.03^{a}	2.02^{a}	2.07^{a}	1.79^{c}	1.92^{b}	*
0-5	1.61^{a}	1.57^{a}	1.58^{a}	1.41^{c}	1.50^{b}	*

* P<0.05, ^{a,b,c}: Mean values with different superscripts within a row differ significantly.

et al., 2003). The results in this study are in agreement with results of studies in which different essential oils were added to poultry diets. In these studies reported that essential oils derived from different aromatic plants have improved feed intake, feed conversion, and carcass yield (Hertrampt, 2001; Williams and Losa, 2001; Tucker, 2002; Alçiçek *et al.,* 2003, Bassett, 2000; Giannenas *et al.,* 2003; Ather, 2000).

Unfortunately, reports on the value of anise oil in poultry are very limited. This study showed that the supplementation 400 mg/kg anise oil in broiler diets significantly improved the daily live weight gain and feed conversion ratio of broilers after a growing period of 5 week. The anise oil could be considered as a potential growth promoter for poultry. As a result, anise oil may be use natural growth promoter substance instead of antibiotics due to the effects of digestive stimulating effect, and antimicrobial effect, and positive effect on performance.

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