

## **The Effect of a Mixture of Herbal Essential Oils on the Performance of Broiler Chicks Originated From Young and Old Broiler Breeder Flocks**

M. Çabuk<sup>1</sup>, M. Bozkurt<sup>2\*</sup> and A. Alçiçek<sup>3</sup> <sup>1</sup>Department of Poultry Science, Akhisar Vocational School of Celal Bayar University, Manisa-Turkey, E-mail: metin.cabuk@deu.edu.tr, <sup>2</sup>Poultry Research Institute, Erbeyli, Aydın-Turkey, <sup>3</sup>Department of Animal Science, Agricultural Faculty of Ege University, Bornova, Izmir-Turkey

### **Abstract**

One thousand and eight unsexed one day-old broiler chicks (Ross-308) were randomly divided into 3 treatment groups of 336 birds each, consist of control and two essential oil mixtures (EOM) at level of 24 mg/kg and 48 mg/kg diet. There were not significant effects of dietary treatments on body weight gain of broilers at 21 and 42 days of age. On the other hand, there were significant differences on the feed intake at days of 21 and 42. The addition of 24 mg/kg or 48 mg/kg EOM to the diet reduced significantly feed intake compared to control at day 21 of age. The groups added essential oil mixture had significant better feed conversion ratio than control at 21<sup>st</sup> and 42<sup>nd</sup> days. There were not significant differences on body weight gain between broilers originated from young and old breeder flock at day 21, whereas significant differences were observed on body weight gain at 42 days of age. Broilers from young breeder flock had significant higher body weight gain than broiler from old breeder flock at 42 days of age. No differences were noticed for carcass yield, liver, pancreas, proventriculus, gizzard, small intestine or large intestine weight. Mortality of the broilers was significantly affected by treatments. Supplementation of essential oil mixture in both level to the diet decreased mortality at days 21 and 42.

### **Introduction**

Antibiotic feed additives have been used for more than 50 years to enhance growth performance and to prevent disease in livestock feeding environments. However, the current trend is to look for alternatives to antibiotic for in feed use because of public concern as to their residues and subsequent occurrence of antibiotic resistance bacteria. As a consequence, new commercial additives of plant origin, considered to be natural products that consumer would accept, have been proposed to animal producer. There is evidence to suggest that herbs, spices, and various plant extracts have appetizing and digestion-stimulating properties and antimicrobial effects (Hernandez et al., 2003; Madrid, et al., 2003 Alçiçek et al., 2004). Breeder age influenced broiler performance and slaughter yield during the various phases of growout period (Peebles et al., 1999). The objective of the present study was, therefore, to examine the effect of dietary supplementation with an essential oil mixture on growth performance of broilers. The second objective was to investigate the effect of broiler breeder age on performance of offspring consuming a mixture of essential oil.

### **Materials and Methods**

One thousand and eight unsexed one day-old broiler chicks (Ross-308) were randomly divided into 3 treatment groups of 336 birds each consist of control and essential oil mixture (EOM) at 24 and 48 mg/kg diet. Each treatment group was further sub-divided in to 8 replicates of 42 birds per replicate. The EOM contained six different essential oils, derived from selected herbs growing in Turkey, viz. 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*), citrus peel oil (*Citrus* sp.). The diets were isocaloric and isonitrogenous. Experimental diet in mash form and water were provided *ad-libitum*.

Chemical compositions of the diets are presented in Table 1. The standard techniques of the proximate analysis were used to determine the nutrient concentrations in the experimental diets (Naumann and Bassler, 1993). The data were analyzed using the General Linear Models procedure of SAS (1987). Significant differences between treatment means were separated using the Duncan's multiple range test.

Table 1. Chemical composition of the experimental diets (as fed)

Composition, % (analyzed)	Treatments		
	Control	24 mg EOM/kg	48 mg EOM/kg
Crude protein (CP)	22.24	21.89	22.03
Ether extract	6.40	6.23	6.04
Starch	35.26	35.83	36.12
Sugar	5.23	4.61	5.17
Total calcium	1.02	1.14	1.03
Total phosphorus	0.70	0.73	0.69
Lysine (calculated)	1.20	1.20	1.20
Met. + Cys. (calculated)	0.92	0.92	0.92
Available phosphorus, (calculated)	0.45	0.45	0.45
Metabolisable energy (Kcal/kg)	3128	3099	3123

## Results and Discussion

In general, no differences on body weight were observed in broiler fed with different diet at days 21 and 42. In agreement our result Botsoglou et al. (2004) reported that supplementation of essential oils to diet had no beneficial effect on body weight. Similar result was observed by Hernandez et al. (2004) found that the addition of two plant extract to the diet had no positive effect on body weight at 42 d. Similar result was observed by Madrid et al. (2003) who studied the effect of plant extract (blend of oregano, cinnamon and pepper essential oil) on broiler performance. In contrast to our result, positive effects of dietary essential oil on body weight were observed by Denli et al. (2004).

Table 2. The effect of the inclusion of an essential oil mixture on body weight, feed intake (g) and the feed conversion ratio (g feed/g gain) of the broilers up to the age of 42 days

Treatments	Body weight gain, g		Feed Intake, g		FCR, g feed/g gain	
	0-21 day	0-42 day	21 day	42 day	21 day	42 day
Control	666.2 <sup>a</sup>	2242.6 <sup>a</sup>	1077.5 <sup>a</sup>	4184.3 <sup>a</sup>	1.62 <sup>a</sup>	1.87 <sup>a</sup>
24 mg EOM/kg	663.4 <sup>a</sup>	2240.3 <sup>a</sup>	1016.3 <sup>c</sup>	4023.6 <sup>b</sup>	1.53 <sup>b</sup>	1.80 <sup>ab</sup>
48 mg EOM/kg	667.6 <sup>a</sup>	2243.6 <sup>a</sup>	1041.0 <sup>b</sup>	3976.8 <sup>b</sup>	1.56 <sup>b</sup>	1.77 <sup>b</sup>
SEM pooled	6.91	16.64	6.23	29.42	0.015	0.025
Probability	0.9295	0.9556	0.0001	0.0002	0.0022	0.0542
Young	665.2	2269.8 <sup>a</sup>	1024.8 <sup>b</sup>	4033.3	1.54 <sup>b</sup>	1.78 <sup>b</sup>
Older	666.3	2214.6 <sup>b</sup>	1065.0 <sup>a</sup>	4089.5	1.60 <sup>a</sup>	1.85 <sup>a</sup>
SEM pooled	5.41	13.58	5.09	24.02	0.012	0.021
Probability	0.4112	0.0093	0.0001	0.1171	0.0070	0.0325

The improvement in feed efficiency and feed intake achieved with essential oil mixture could be attributed to its positive effects on nutrient digestibility as reported by Langhout (2000); Hernandez et al. (2004); Alcicek et al. (2003); Madrid et al. (2003). Our findings are also in agreement with those of Lee et al. (2003) who studied carvacrol from oregano, those of Alcicek et al. (2004) who used 48 mg/kg EOM in the diet. These could be interpreted that essential oil and their mixture could positively affect the intestinal microflora and thus

digestion. In contrast to our result, Hernandez et al. (2004) found that the addition of two plant extracts to the diet had no beneficial effect on feed conversion ratio. Moreover, Botsoglou et al. (2004) found also that a mixture of herbal essential oil had no beneficial effect on feed conversion ratio. Chickens fed with the diet containing essential oil mixture at levels of 24 and 48 mg/kg diet consumed significantly lower feed than chickens fed with control diet. Our result is in agreement with those of Madrid et al. (2003) who studied effect of plant extract, those of Lee et al. (2003) who used carvacrol. Furthermore, Denli et al. (2004) reported that addition of thyme essential oil to the quail diet improved feed efficiency. In contrast to our result, Hernandez et al. (2004) reported that the addition of two plant extracts to the diet had no beneficial effect on feed intake. In addition, Botsoglou et al. (2004) found that supplementation with diet oregano essential oil and a mixture of essential oil to diet did not effect on feed intake. When parent age effects evaluated, there were not significant differences on 0 to 21 d body weight gain of broilers as progeny of young and old breeder flock. But significant differences were observed on body weight gain at 42 d. Moreover broilers from young breeder flocks had significant higher body weight gain than that of broilers from old breeder flock. The feed intake was significantly affected by parent age at day of 21. Offspring of young broiler breeder had lower feed intake than offspring of old broiler breeder. But parent age had no significant effect on feed intake at day 42. Feed conversion ratio was significantly influenced by parent age both at 21 and 42 days. Thus, offspring of young broiler breeder had better feed conversion ratio than that of offspring of old broiler breeder.

The results indicated that the supplementation of a mixture of herbal essential oils to the diet significantly reduced feed intake and improved feed conversion ratio. The herbal essential oil mixture may be considered as a potential growth promoter. However, detailed researches for the effect of essential oil supplementation to diet on performance of broilers are required.

### References

- ALÇIÇEK, A., BOZKURT, M. and ÇABUK, M.** (2003). The effects of an essential oil combination derived from selected herbs growing wild in Turkey on broiler performance. *South African Journal of Animal Science* **33**:89-94.
- ALÇIÇEK, A., BOZKURT, M. and ÇABUK, M.** (2004). The effects of a mixture of herbal essential oil, an organic acid or a probiotic on broiler performance. *South African Journal of Animal Sci.* **34**: 217-222.
- BOTSOGLOU, N. A., FLOROU-PANER, P., CHRISTAKI, E., FLETOURIS, D. J. and SPAIS, A. B.** (2002). Effect of dietary oregano essential oil on performance of chickens and on iron-induced lipid oxidation of breast, thigh and abdominal fat tissues. *Br. Poult. Sci.* **43**: 223-230.
- BOTSOGLOU, N. A., CHRISTAKI, E., FLOROU-PANERI, P., GIANNENAS, I., PAPAGEORGIOU, G. and SPAIS, A.B.** (2004). The effect of a mixture of herbal essential oils or  $\alpha$ -tocopheryl acetate on performance parameters and oxidation of body lipid in broilers. *South African Journal of Animal Science* **34**:52-61.
- DENLI, M., OKAN, F. and ULUOCAK, A., M.** (2003). Effect of dietary supplementation of herb essential oils on the growth performance carcass and intestinal characteristics of quail (*Coturnix coturnix japonica*). *South African J. of Animal Sci.* **34**:174-179.
- HERNANDEZ, F., MADRID, J., GARCIA, V., ORENCO, J. and MEGIAS, M. D.** (2004). Influence of two plant extracts on broiler performance, digestibility, and digestive organ size. *Poultry Sci.* **83**: 169-174
- LANGHOUT, P.** (2000). New additives for broiler chickens. *W. Poult.-Elsevier* **16**: 22-27.
- LEE, K. W., EVEREST, H., KAPPERT, H. J., YEOM, K. H. and BEYNEN, A. C.** (2003). Dietary Carvacrol lowers body weight gain but Improves feed conversion in female broiler chickens. *Appl. Poult. Res.* **12**:394-399.
- MADRID, J., HERNANDEZ,F., GARCIA,V., ORENCO,J., MAGIAS,D. and SAVILLA, V.**(2003).14<sup>th</sup> European symposium on poultry nutrition. August 10-14,Norway
- NAUMANN, C. and BASSLER, R.** (1993). *Die chemische Untersuchung von Futtermitteln. Methodenbuch, Band III. 3. Erg.,VDLUFA-Verlag, Darmstadt.*
- SAS,** (1987).*Statistical Analysis Systems user's guide (3. ed.).SAS Insti Inc. N. Carolina.*
- PEEBLES, E. D., S. M. DOYLE, T. PANSKY, P. D. GERARD, M. A. LATOUR, C. R. BOYLE, and T. W. SMITH,** (1999). Effects of breeder age and dietary fat on subsequent broiler performance. 1. Growth, mortality and feed conversion. *Poult. Sci.* **78**:505-511.