The Effect of an Essential Oil Mix Derived from Oregano, Clove and Anise on Broiler Performance

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Abstract: This study was conducted to explore the usage of essential oil mix (EOM) in broiler nutrition as a natural growth promoting substance instead of antibiotics. Different levels of EOM 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 and fifty five day-old broilers (Ross-308, n = 250) were divided into five equal groups as follows. Control group (no EOM or antibiotic), 100 ppm EOM group, 200 ppm EOM group, 400 ppm EOM group and an Antibiotic group (0.1% Avilamycin). The diets were prepared freshly each day. Experiment carried out 35 days. The feed intake was similar between the groups (p>0.05), but the highest daily live weight gain was observed in the 200 ppm EOM group (71.31 g) followed by Antibiotic group (65.84 g), 100 ppm EOM oil group (63.40 g), control group (61.30 g) and 400 ppm EOM group (61.17 g). Thus, daily live weight gain increased in 200 ppm EOM group by approximately 16% over the control group and approximately 8% over the antibiotic group. Feed conversion ratio was improved in 200 ppm EOM group by approximately 12% over the control group and approximately 6% over the antibiotic group. The results show that, EOM could be considered as a potential natural growth promoter for poultry.

Key words: Essential oil mix, antibiotic, performance, broiler

Introduction
Plants have played a significant role in maintaining human health and improving the quality of human life for thousands of years, and have served humans well as valuable components of seasonings, beverages, cosmetics, dyes, and medicines. 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 foods; however, we now understand that certain materials also have added technical benefits that may be exploited to maintain animal performance. Furthermore, many Western drugs had their origin in a plant extract (Craig, 1999).

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 aromatic plants are used extensively in medicine and in the food and cosmetic industries. In addition to their antimicrobial activity (Singh et al., 2002; Elgayyar et al., 2001; Valero and Salmeron, 2003), they possess 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 hypocholesterolemic agents (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). As an aromatic plant, oregano (Origanum vulgare L.) has been used in medicine for a long time. Today, the plant is still sometimes used in folk medicine. As a medicinal plant, oregano has been used as an antimicrobial (Dorman and Deans, 2000; Elgayyar et al., 2001; Marino et al., 1999; Valero and Salmeron, 2003; Burt and Reinders, 2003), anticoagulant (Giannenas et al., 2003), antifungal (Pina-Vaz et al., 2004; Soliman and Badea, 2002), antispasmodic (Meister et al., 1999) and antioxidant (Lee and Shibanoto, 2002; Miura et al., 2002; Youdim and Deans, 1999; Zheng and Wang, 2001). In addition, it has stimulating effect of digestion and antiseptic (Çabuk et al., 2003). Similarly, Clove
(Syzygium aromaticum L.) has been used as an antiseptic (Robenorst, 1998; Çabuk et al., 2003) antimicrobial (Dorman and Deans, 2000; Ouattara et al., 1997; Teissedre and Waterhouse, 2000; Valero and Saimeron, 2003), analgesic and local anesthetic (Feng and Lipton, 1987). In addition, it has an appetite-stimulating and stimulating effect of digestion (Çabuk et al., 2003), antifungal (Velluti et al., 2003), antipyretic (Feng and Lipton, 1987), antiparasitic (Kim et al., 2004) and antioxidant (Güler et al., 2004; Lee and Shibamoto, 2002). 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 (Affifi et al., 1994).

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

**Materials and Methods**

Two hundred and fifty five day-old broilers (Ross-308) were divided into five treatment groups of 50 birds each and randomly assigned to the five treatment diets. Experiment was carried out 35 days. Each treatment group was further sub-divided into five replicates of 10 birds per replicate. The presence and levels of EOM and antibiotic in diets were the main factors tested. In the control group the birds were fed a standard diet (20-27.0% CP and 3.0-3.25 McAl ME/kg) (Control group). Three different levels of EOM (Özdörg 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 EOM treatments, 100 ppm (100 EOM group), 200 ppm (200 EOM group), and 400 ppm (400 EOM group) EOM 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. EOM was dissolved in vegetable oil and then gently mixed with the standard diets. Antibiotic was
Table 2: The effect of diets varying in amounts of essential oil mix and antibiotic on the daily feed intake of broilers (g/bird/day) (n=5)

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Control</th>
<th>100</th>
<th>200</th>
<th>400</th>
<th>Antibiotic</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>41.86</td>
<td>42.09</td>
<td>42.63</td>
<td>43.27</td>
<td>41.77</td>
<td>NS</td>
</tr>
<tr>
<td>2</td>
<td>72.62</td>
<td>73.25</td>
<td>74.39</td>
<td>75.86</td>
<td>72.05</td>
<td>NS</td>
</tr>
<tr>
<td>3</td>
<td>93.89²</td>
<td>93.63ᵇ</td>
<td>96.61ᵃ</td>
<td>97.75ᵃ</td>
<td>94.99ᵇ</td>
<td>*</td>
</tr>
<tr>
<td>4</td>
<td>132.19</td>
<td>132.62</td>
<td>134.68</td>
<td>135.93</td>
<td>132.69</td>
<td>NS</td>
</tr>
<tr>
<td>5</td>
<td>152.46</td>
<td>152.81</td>
<td>154.93</td>
<td>155.21</td>
<td>152.39</td>
<td>NS</td>
</tr>
<tr>
<td>0-5</td>
<td>98.56</td>
<td>98.88</td>
<td>100.61</td>
<td>101.60</td>
<td>98.78</td>
<td>NS</td>
</tr>
</tbody>
</table>

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

The effect of EOM and antibiotic on feed conversion ratio is presented in Table 4. From weeks 1 to 5, feed conversion ratios differed significantly between the groups (p<0.05). Addition of 200 ppm EOM to the diets improved feed conversion ratio by approximately 12% compared to the control group. This improvement remained at 6.8% level in antibiotic group and at 0.9% level in 100 ppm EOM group. Compared to the antibiotic group, addition of 200 ppm EOM to the diets improved feed conversion ratio by approximately 3.7%.

As shown, daily live weight gain and feed conversion ratio were increased statistically in 200 EOM group compared to the control and antibiotic groups. These differences among the groups may be due to active ingredient such as thymol and carvacrol in oregano oil, eugenol in clove and anethole in anise. Because, thymol, carvacrol, eugenol and anethole have digestive stimulating effects (Çabuk et al., 2003). Besides, thymol, carvacrol, eugenol and anethole affected pathogen microorganism in the digestive system and increased live weight gain and feed conversion. Essential oils derived from oregano, clove and anise have been reported to posses antimicrobial (Dorman and Deans, 2000; Valero and Salmeron, 2003; Burt and Reinders, 2003; Singh et al., 2002; Tabanca et al., 2003), anticoagulant (Giannenas et al., 2003), antifungal (Pina-Vaz et al., 2004; Soliman and Badea, 2002; Velluti et al., 2003) and antioxidant effects (Lee and Shibamoto, 2002; Gülçin et al., 2004). Additionally, clove and anise have been used as an antiparasitic (Kim et al., 2004; Çabuk et al., 2003) and antipyretic agents (Feng and Lipton, 1981).
1987; Afifi et al., 1994). The improved feed utilization in 200 ppm EOM group in our study could be due to these positive effects of essential oils on the digestive system. The reason of reducing in 100 ppm EOM group may be due to low essential oil concentration in digestive system and high essential oil concentration in 400 ppm EOM group could be affected negatively digestive system. Besides, essential oils positively affected digestibility of nutrient. For example, essential oils increase digestion of protein, cellulose and fat (Jamroz and Kamel, 2002), improve apparent whole-tract and ileal digestibility of the nutrients (Hernandez et al., 2004) and increase the effects of pancreatic lipase and amylase (Ramakrishna et al., 2003). The improved daily live weight gains and feed conversion ratios of birds fed the diets containing 200 ppm EOM in this study agreed with results reported in literatures. Alichek et al. (2003) reported that addition of essential oil combination (derived from oregano, laurel, sage, myrtle, fennel and citrus) at 48 mg/kg level improved body weight and feed conversion ratio compared to control and antibiotic groups in broiler. Similarly, Ather (2000) reported that broiler performance was improved when using a poly herbal premix which contained five herbs. These results are in agreement with results of studies in which different essential oils were added to poultry diets. In these studies essential oils derived from different aromatic plants have been reported to improve feed intake, feed conversion ratio and carcass yield (Hertrampt, 2001; Williams and Losa, 2001; Tucker, 2002, Alicieh et al., 2003, Bassett, 2000, Giannenas et al., 2003; Ather, 2000).

Unfortunately, reports on the value of essential oils in poultry are limited. This study showed that the supplementation of 200 ppm essential oil mix (include oregano, clove and anise oils) in broiler diets significantly improves the daily live weight gain and feed conversion ratio during a growing period of 5 weeks. Thus, essential oil mix could be considered as a potential growth promoter for poultry due to digestive stimulating effect, antimicrobial effect, and positive effect on performance.

References


