Short Communication

Effect of supplementation of Oregano (Origanum onites) Dried Leaves on the Intestinal Properties in Japanese Quails

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ABSTRACT

This study was designed to evaluate the effect of supplementation of Oregano dried leaves in the quail diet on the intestinal properties and gut morphology. Quails fed diets containing 0% (A), 1% (B), 2% (C), 3% (D), 4% (E) and 5% (F) dried ground Oregano leaves. Results revealed that villus height was significantly higher in group D compared to control group, whereas crypt depth was significantly higher in all supplemented groups specifically remarkable in group D. Thickness of the tunica muscularis was higher in group C while other groups like D, E and F showed reduction in thickness compared to control group. Overall, this study data suggest that group D, which was supplemented with 3% dried oregano leaves, showed better performance than control. We conclude here that Oregano dried leaves may have the potential activity to modify the gut morphology and can result in better performance of the quail by increasing the nutrient absorption from the intestine.

Poultry farming is popular due to its efficient production and short time span. Poultry meat is contributing 50% share in the world meat production (USDA, 2015). Among the poultry, quail meat is getting popularity as it is delicious and has less cholesterol. Better feed utilization is the important factor for efficient growth rates. In feed low levels antibiotic are used to increase nutrient utilization by causing the thinning of intestinal lining and preventing or suppressing the infections. These antibiotics cause serious health problem which is widely known as drug resistance. To avoid drug resistance, alternative solutions are being explored, especially after the complete banned antibiotics in feed by European Union.

Herbal products, like leaf powders and extracts, are being used to evaluate their potential to be used in poultry nutrition to replace antibiotics (Nychas, 1995). Herbs are natural products and posed no threat on the consumer health. The use of herbs is from the prehistoric times at home remedies for the cure of flu, and some digestive disorders (Dragland et al., 2004). Phytogenic products are also known to possess good effect on the intestinal functions by improving the absorption of nutrients and production of mucous. Phytobiotics are also known to have effect on intestinal morphology by improving the villus height, crypt depth and tunica muscularis thickness as well as antioxidant properties (Awad et al., 2008).

Among phytogenics, Oregano (Origanum onites) is also being investigating for its potential to be used in poultry rations. Oregano is commonly grown in Mediterranean region which is containing phenolic compounds and antioxidant in major proportion (Chun...
Oregano is composed of more than 60 different compounds but major constituents are carvacrol and thymol (Teixeira et al., 2013). In previous studies, it was found that oregano dried leaves supplementation has potential to improve egg taste and fertility without exerting any adverse effect in quails (Cetingul et al., 2007, 2009). Oregano extract is known to possess improved impact on growth performance of quails (Yasilbag et al., 2012) by improving the gut morphology and increasing the nutrient digestibility and absorption. In view of above facts, this study was designed to evaluate the effects of supplementation of oregano dried leaves powder in quail diet on the villus height, crypt depth and tunica muscularis thickness in the quail intestine, which directly influence the nutrient absorption and utilization leading to improved performance of broiler.

### Materials and methods

Data was taken from the project No. 042VF11, which was conducted at the Animal Research Centre of Afyon Kocatepe University, Turkey. In this study, a total of 180 day old quail birds were procured from a local reputed hatchery. Birds were divided into 6 groups having 30 birds in each. Each group was further subdivided into 6 subgroups having 5 birds in each. The study was conducted for 70 days.

A total of 6 different diets were formulated containing 0%, 1%, 2%, 3%, 4%, and 5% dried oregano leaves and fed to groups A (Control), B, C, D, E and F, respectively. Dried oregano leaves were purchased from the reputed local market in Afyonkarahisar city. Diets were formulated isonitrogenic and isocaloric according to the recommendations of NRC (1994). Ingredient and chemical composition of diets mentioned in Table I.

### Table I.- The ingredient and calculated nutrient/chemical composition of diets.

<table>
<thead>
<tr>
<th>Ingredient/ nutrients</th>
<th>Group A (control)</th>
<th>Group B</th>
<th>Group C</th>
<th>Group D</th>
<th>Group E</th>
<th>Group F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>34.70</td>
<td>37.00</td>
<td>34</td>
<td>36</td>
<td>35</td>
<td>34</td>
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<tr>
<td>Wheat</td>
<td>30.00</td>
<td>27.00</td>
<td>28</td>
<td>27</td>
<td>27</td>
<td>26</td>
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<tr>
<td>Full fat soya bean</td>
<td>9.40</td>
<td>10.00</td>
<td>14</td>
<td>10.50</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>17.50</td>
<td>16.00</td>
<td>13</td>
<td>14</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Oregano leaves</td>
<td>-</td>
<td>1.00</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Fish meal</td>
<td>1.30</td>
<td>2.03</td>
<td>2</td>
<td>2.77</td>
<td>3.46</td>
<td>3.31</td>
</tr>
<tr>
<td>Lime stone</td>
<td>5.30</td>
<td>5.35</td>
<td>5.33</td>
<td>5.20</td>
<td>5.10</td>
<td>5.20</td>
</tr>
<tr>
<td>DCP</td>
<td>1.07</td>
<td>0.90</td>
<td>.94</td>
<td>0.80</td>
<td>0.70</td>
<td>0.75</td>
</tr>
<tr>
<td>Salt</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Vitamin premix*</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Mineral premix*</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Methionine</td>
<td>0.13</td>
<td>0.12</td>
<td>0.13</td>
<td>0.13</td>
<td>0.14</td>
<td>0.14</td>
</tr>
</tbody>
</table>

**Calculated composition**

| ME (MJ/kg)          | 12.13            | 12.11            | 12.12            | 12.02            | 12.04            | 12.05            |
| DM (g/kg)           | 89.10            | 89.20            | 89.20            | 89.10            | 89.10            | 89.20            |
| CP (g/kg)           | 19.90            | 19.90            | 19.90            | 19.80            | 19.80            | 19.80            |
| CF (g/kg)           | 2.60             | 2.60             | 2.50             | 2.50             | 2.50             | 2.60             |
| Fat (g/kg)          | 3.33             | 3.46             | 4.10             | 3.54             | 3.97             | 4.61             |
| Calcium (g/kg)      | 2.47             | 2.50             | 2.50             | 2.47             | 2.47             | 2.49             |
| Available P (g/kg)  | 0.35             | 0.34             | 0.35             | 0.35             | 0.35             | 0.35             |
| Methionine + cystine (g/kg) | 0.71 | 0.70     | 0.71     | 0.71     | 0.71     | 0.70     |
| Lysine (g/kg)       | 1.19             | 1.17             | 1.17             | 1.15             | 1.15             | 1.13             |
| Linoleic acid       | 1.60             | 1.70             | 2.00             | 1.70             | 1.90             | 2.20             |

*Levels of vitamin per 2.5 kg and mineral supplements per 1 kg product: Vit. A, 12 000.000 UI; Vit. D3, 2 000.000 UI; Vit. E, 35.000 mg; Vit. K3, 4000 mg; Vit. B1, 3000 mg; Vit. B2, 7.000 mg; Vit. B6, 5.000 mg; Vit. B12, 15 mg; niacin, 20.000 mg; D-Biotin, 45 mg; Apo Carotenoid acid ester, 500 mg; Folik Asit, 1 000 mg; Kolin Klorid, 125 000 mg; Vit. C, 50 000 mg; Kal D-Pantothenenate, 10.000 mg; Ksanthaxantine, 1500 mg; copper, 5.000mg; cobalt, 200 mg; selenium, 150 mg; manganese, 80.000 mg; zinc, 60.000 mg; zodine, 1.000 mg; iron, 60.000 mg; DL-Methionine, 99% pure; DCP, Dicalcium phosphate; ME, Metabolisable energy; DM, Dry matter; CP, Crude protein; CF, Crude Fiber. Groups A, B, C, D, E and F supplemented with 0%, 1%, 2%, 3%, 4%, and 5% dried oregano leaves respectively.
A total of 36 birds were slaughtered, by picking one bird from each subgroup randomly, at the age of 70 days. Intestinal samples were collected for histopathological examination using previously described method by Awad et al. (2011). Different segments of intestine were collected for the measurement of villus height, crypt depth and tunica muscularis thickness. Collected samples were preserved for 48 h in 10% buffered formalin solution. Samples were cut and imbedded in paraffin for routine histological examinations. After imbedding, 4 micrometer section was cut from each block by microtome, mounted on slide and stained by hematoxylin and eosine (HE) as describe by Sakamoto et al. (2000) and Santos et al. (2005). Prepared slides were examined in a light microscope equipped with digital camera (Olympus CX41 attached Kameram R Digital Image Analyze System) from different 10 places for each parameters in each slide. The villus height was taken from top of the villus up to the lamina propria (Sakamoto et al., 2000). Crypt depth was analyzed between the crypt and villus while mucosa (Muscularis thickness) was measured from the top of villus to the base of the muscularis mucosa (Aptekmann et al., 2001).

Data was subjected to ANOVA for a completely randomized design (Steel et al., 1997). Duncan’s multiple range test (Duncan, 1955) was used to check the mean differences.

**Results and discussion**

Gut morphology plays an important role in the proper digestion and utilization of feed nutrients. Better digestion will ultimately reduce the cost of production by improving the feed conversion ratio (FCR) (Tarachai and Yamauchi, 2000). In the current years, the use of natural herbal products in the poultry diet is being explored and evaluated to enhance the production performance of birds. Researchers have paid enormous efforts to investigate the potential of phytogenics to be used as alternative of antibiotics (Wang and Bourne, 1998; Rafeeq et al., 2017). The results of current study indicated that villus height was significantly lesser (P<0.05) in groups B, C, and F, which were supplemented with 1%, 2% and 5% oregano leaves, respectively, however it was surprisingly observed higher (P<0.05) in group D, which was supplemented with 3% oregano leaves as compared to control group A as shown in Table II. In this study, oregano dried leaves have revealed that supplementation of feed with oregano leaves resulted in improved villus height. This result is supported by Jamroz et al. (2006) who showed that phytogenic extract supplementation has pronounced impact on the performance in improving villus height of intestine. It is noteworthy to mention that increased villus height is also responsible for the better performance by improving surface area and absorption of nutrients (Caspary, 1992).

Many intestinal parameters are involved in digestive processes which are correlated with each other to support and enhance the performance and better feed utilization of nutrients. Crypt depth is also playing a vital role in surface area and gut functioning. In the current study, crypt depth showed higher value (P<0.05) in all groups compared to control, having highest crypt depth in group D supplemented with 3% oregano leaves. Likewise, in previous studies (Denli et al., 2004; Parlat et al., 2005; Çabuk et al., 2006; Alçiçek et al., 2004), it has been observed that feed conversion ratio (FCR) was improved in the oregano oil supplemented groups which favors the concept that improvement in FCR might have resulted from improved gut morphology.

Passage rate of digesta determines the rate of absorption of nutrients from the intestine into the blood. Tunica muscularis is also responsible for the integrity and normal passage rate of digesta. In this study, muscularis thickness was shown higher (P<0.05) in groups C, D, E and F, while group B demonstrated non-significant (P>0.05) difference as compared to group A. Similarly, in other studies it has been proved that the supplementation of herbal extract (mixture of oils and dried material) resulted in improved growth rate, FCR, feed intake and overall performance through improvement of gut morphology (Lee et al., 2003; Jang et al., 2004; Jamroz et al., 2006).

**Conclusion**

Oregano-supplementation has shown potential effect
on the gut morphology by improving the villus height, crypt depth and tunica muscularis thickness in the groups D, C and E, respectively. It is recommended to use upto 5% level of oregano dried leaves in the diet of quail to improve performance. It is suggested to investigate the potential of oregano extensively which could replace the use of antibiotics in poultry diets.

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**Statement of conflict of interest**
Authors have declared no conflict of interest.

**References**


