Effects of Different Dietary Levels of Propolis on Performance, Carcass Characteristics and Immunity Response of Broiler Chickens

Ainaz Khodanazary¹, Ahmad Tatar ²* and Mansoor Khezri ³

¹ Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran
² Department of Poultry Sciences, Faculty of Animal Sciences and Food Sciences, Ramin Agricultural and Natural Resources University, Mollasani, Ahwaz, Iran
³ Ph.D. Student of Animal Nutrition, Department of Animal Sciences, Zanjan University, Zanjan, Iran.

*Correspondence Author; Email: tatar@ramin.ac.ir

Abstract
Six hundred one-day-old broiler chicks were randomly assigned to six groups. Each group was five replicates with 20 birds per replicate. The dietary groups consisted of the supplementation of the basal diet with 0, 0.5, 1.0, 1.5, 2.0 and 3.0 g/kg diet of propolis. At 42 d., 10 chickens per each group were selected and slaughtered to determine the carcass characteristics. On d. 21 and 42 two chicks of each replicate were randomly selected and their blood samples were collected. The separated serums by centrifugation were used for antibody titration against Newcastle viruses. The results indicated that birds diet supplementation with propolis increased body weight and feed intake (P<0.05) and also improved feed efficiency (P<0.05) during the experiment. Mortality was significantly greater in the control group than in the experimental groups. The carcass yield values showed significant effects of dietary propolis on the eviscerated carcass percentage. There is significant difference (P<0.05) between antibody content of the serum against Newcastle disease (ND).

Keywords: Propolis, Broiler, Immunity response, Performance

Objectives
Antibiotics have been used in animal husbandry as feed additives since shortly after their discovery. For a number of years antibiotics have been used extensively as growth promoters in animal feeds all over the world especially in the poultry and pig production industries. The use of antibiotics in diet as growth promoters is aimed primarily at the improving of growth performance of poultry such as improved feed efficiency and increasing body weight gains in broiler production. However, concerns of antimicrobial resistance have existed for nearly as long, but concerns regarding the prevalence of antibiotic-resistant infections in human have raised the controversy to new heights (REVINGTON, 2002). Due to these reasons the use of antibiotics has been limited in the European Union (EU).

Over the several last year’s using the prebiotics, probiotics and natural products is going to be substituted for antibiotics in order to improve immune system and fight against pathogens in human and animal life. In contrast to antibiotics these products do not have side effects and are very useful in food chain. Therefore, alternatives to antibiotics are of great interest to the poultry industry. One alternative may be incorporation of propolis into broiler diets. Propolis is an adhesive, dark yellow to brown coloured balsam that smells like resin. It is collected from buds, leaves and similar parts of trees and plants like pine, oak, eucalyptus, poplar, chestnut, etc. by bees and mixed with wax (VALLE, 2000). More than 300 constituents have been identified in different propolis samples (BANSKOTA et al., 2001). Propolis is alleged to exhibit a broad spectrum of biological activities including antibacterial (KUJUMGIEV et al., 1999; SFORCIN et al., 2000; VELIKOVA et al., 2000; MOCHIDA et al., 1985), antifungal (SAWAYA et al., 2002), antiviral (AMAROS et al., 1994), anti-inflammatory (STREHL et al., 1993), antioxidant (ISLA et al., 2001), immunostimulating
properties. Also, most studies have indicated that, propolis compounds such as quercetin, luteolin (flavonoids), artepillin-C, caffeic acid and caffeic acid phenyl ester exhibit antitumour effect (MATSUNO et al., 1997). Literature survey revealed that flavonoids, aromatic acids, diterpenic acids and phenolic compounds appear to be the principal components responsible for the biological activities of propolis samples. Information concerning the characteristics of Iranian propolis is still quite limited. The objective of this study was to determine the effects of 96% ethanolic extract of propolis samples collected from different regions of Kurdistan on growth performance, carcass traits and immune response of commercial broilers.

**Materials and Methods**

Six hundred 1-day-old (Ross 308) broiler chicks were randomly assigned to six groups. Each group was replicated five times with 20 birds per replicate. A corn-soybean meal basal starter and finishing diets was formulated to meet or exceed the nutrient requirement guidelines of NATIONAL RESEARCH COUNCIL (1994). The dietary groups consisted of the supplementation of the basal diet with 0 (control), 0.5, 1.0, 1.5, 2.0 and 3.0 g/kg diet of propolis. The birds were fed with starter diet until 21 days of age, followed by finishing diet until 42 days of age. Experimental diets and water were provided for ad libitum consumption. At the end of the trial (day 42) ten chickens in each group with a BW close to the group average, were selected and slaughtered to determine the carcass characteristics. The feathers, heads, legs and inner organs (except liver) of the chickens were removed. The carcasses were kept at +4 °C for 24 h; then the legs (from articulatio coxae), breast (from articulatio sternocostalis), wings (from articulation humeri), neck and back were removed. The organs were weighed with the skin. The chickens were immunized against diseases with the Newcastle disease (ND, B1, day 10, eye drop; Lasota days 20 and 32, drinking). On days 21 and 42 two chicks of each replicate were randomly selected (ten birds per group) and their blood samples were collected via brachial vein. The separated serums by centrifugation (3000 RPM, 10 minutes) were used for antibody titration against Newcastle (ELISA method) viruses by standard procedures.

Data from this experiment were evaluated by ANOVA using General Linear Model's procedures (SAS Institute, 2001). Significant difference (P<0.05) between main effects were detected by DUNCAN (1955) multiple range test. The Mortality data were transformed to arcsine percentage prior to statistical analysis.

**Results and Discussion**

The results showed that there was a higher growth performance in broiler chicks when propolis was included in the diets. The addition of propolis at 1.0, 1.5, 2.0 and 3.0 g/kg in the diet significantly increased growth parameters of broiler chicks such as body weight gain and feed intake and improved feed efficiency and mortality rate compared with control (P<0.05). Propolis has palatable substances like resin, wax, honey and vanillin (SHALMANY and SHIVAZAD, 2006). In the present study, the increase in FI and performance could be linked to the palatable characteristic of propolis diets. Furthermore, It could be inferred that the antimicrobial activity of the components of the propolis extract, resulting in better intestinal health and improving digestion and absorption. In addition to their antimicrobial activity (KUJUMGIEV et al., 1999), they possess biological activities such as that of antioxidants (ORHAN et al., 1999). In a study related to propolis supplementation conducted in broilers to determine the effects of propolis on FI, BW increase and FCR, five different propolis added diets (50, 100, 150, 200, 250 mg/kg diets) were used (SHALMANY and SHIVAZAD, 2006). This study indicated that propolis diet with 250 mg/kg considerably improved performance. Furthermore, in a previous study (GHISALBERTI, 1979) with 500 ppm propolis addition to
broiler feed, the BW of propolis group increased 20% more than the control group. This could be due to flavonoid content and palatable properties of propolis. Flavonoids show antioxidant characteristics by chelating with trace elements or radicals (WANG et al, 2004). Our results agree with the findings of BIAVATI et al (2003), who reported that Alternanthera brasiliana and propolis extracts increased body weight gain on the 7th day of broilers.

In contrast to our results, BOTSOGLOU et al (2004) found that the addition of essential oils to the broiler diet had no beneficial effect on broiler performance. In another trial, DE-FREITAS et al. (2001) reported that the supplementation of garlic extract to the broiler diet had no suitable as substitute growth promoters.

Results of this experiment showed there is significant difference (P<0.05) between antibody content of the serum against Newcastle disease (ND). Highest concentration is related to 2.0 and 3.0 g/kg propolis groups for ND. Propolis was reported to have effects on the immune system by increasing macrophage activity, changing microbial population in stomach and intestine lumen, and stimulating lymphatic tissues (TAHERI et al., 2005). Also, antioxidant (KUMAZAWA et al., 2004) and anti-inflammatory (BORRELLI et al., 2002) qualities of propolis have a significant effect on the immune system. The effect of natural products such as propolis on immune system of different species is interesting and complicated. The direct effect might be related to stimulating the lymphatic tissue in the digestive system, and indirect effect via changing the microbial population of the lumen of GIT.

At the moment there is no specific answer to this question, but it is very obvious that propolis is able to enhance the immune response to different antigenic stimulants even in mouse (SCHELLER et al., 1988). In this study, percentage of eviscerated and breast muscle were statistically different among the groups (P<0.05). Carcass yield and breast meat content rate of birds fed propolis were statistically higher than the control group (P<0.05). The positive effect of propolis on FI and FCR has increased carcass yield and breast meat content.

**Table 1.** Effects of dietary propolis in broiler's performance, carcass characteristics and antibody titer to NDV.

<table>
<thead>
<tr>
<th>Propolis (g/kg)</th>
<th>Performance (8-42 d)</th>
<th>Carcass (%)</th>
<th>ND titer (day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BW (gr)</td>
<td>FI (gr)</td>
<td>FCR (gr:gr)</td>
</tr>
<tr>
<td>0</td>
<td>1438</td>
<td>3120</td>
<td>2.17</td>
</tr>
<tr>
<td>0.5</td>
<td>1535</td>
<td>33240</td>
<td>2.15</td>
</tr>
<tr>
<td>1.0</td>
<td>1568</td>
<td>3320</td>
<td>2.13</td>
</tr>
<tr>
<td>1.5</td>
<td>1580</td>
<td>3348</td>
<td>2.12</td>
</tr>
<tr>
<td>2.0</td>
<td>1689</td>
<td>3379</td>
<td>2.00</td>
</tr>
<tr>
<td>3.0</td>
<td>1694</td>
<td>3386</td>
<td>2.00</td>
</tr>
<tr>
<td>SEM</td>
<td>20.86</td>
<td>36</td>
<td>0.005</td>
</tr>
</tbody>
</table>

<sup>P<0.05, (*) mean values with different superscripts within a row differ significantly.</sup>

**Conclusion**

In conclusion, this study demonstrates that propolis supplementation especially at 2.0 and 3.0 g/kg feed, increases the growth performance and improved the humoral immunity of broiler chickens. Therefore, it may serve as a natural substitute for antibiotics in poultry diets. However, more experiments are needed to explain whether propolis can affect of antimicrobial or antioxidant in poultry diets.
Acknowledgments
The authors are greatly acknowledging Ramin Agricultural and Natural Resources University, Khuzestan, Iran.

Literature