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INFLUENCE OF SOME HONEY BEE PRODUCTS AND A GROWTH PROMOTER SUPPLEMENTATION ON PRODUCTIVE AND PHYSIOLOGICAL PERFORMANCE OF BROILER CHICKENS

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ABSTRACT: The present study was conducted to evaluate the effects of propolis, bee-pollen and bee-venom as eco-friendly alternative on productive and physiological performance of broiler chickens. A total of 408 unsexed one week old, Cobb 500 broilers were randomly divided into 8 experimental treatments (3 replicate, 17 chicks each). The first treatment was fed basal diet without any additives and served as a control. The second treatment was fed the basal diet supplemented with the growth promoter Biox-Y® 0.5g per kg of diet. The third and the forth treatments were fed basal diet supplemented with propolis (200 or 400 mg/kg diet). The fifth and the sixth treatments were fed basal diet supplemented with bee-pollen (1 or 2 g/kg diet). The seventh and the eighth treatments were fed the basal diet and their water was supplemented with bee-venom (1 or 2 mg/L water). Weekly body weight, body weight gain, feed intake and feed conversion ratio obtained. Blood samples were obtained at the end of the experiment (7 weeks of age) to determine blood parameters. The obtained results showed that the chicks fed diet with propolis (400 mg/kg diet) had significantly higher body weight and total body weight gain compared to the control treatment. Also, all treated treatments had significantly lower average daily feed intake during the whole experimental interval and significantly improved total feed conversion ratio compared to the control and Biox-Y® treatments. The chicks fed diets containing propolis (200 or 400 mg/kg diet) or bee-venom (2 mg/L water) or bee-pollen (2 g/kg diet) showed significantly lower plasma cholesterol and LDL-cholesterol concentration compared to the control and Biox-Y® treatments. Consequently, propolis (200 or 400 mg/kg diet) treatments and bee-pollen (2 g/kg diet) treatment had significantly higher plasma HDL cholesterol concentration than the control treatment. Broilers fed propolis (200 or 400 mg/kg diet) for 6 weeks had significantly lower serum AST and ALT concentrations compared to the control treatment. The chicks fed diet with propolis (400 mg/kg diet) showed significantly higher plasma T3, T4 concentration or T3/T4 ratio compared to the control treatment.

Keywords: Broiler chicks-productive performance- blood metabolites-honey bee products.

INTRODUCTION

Antibiotics have been added to poultry diets to stabilize intestinal microflora, improves the growth performance and prevent infection resulted in specific pathogenic microorganisms. However, concerns about antimicrobial resistance have existed for several decades, and recent concerns regarding the prevalence of antibiotic-resistant infections, in humans, have raised the controversy to new heights (Revington, 2002). For these causes antibiotic growth promoters for poultry diets have been prevented for use and pressure from consumers and major poultry buyers has threatened their removal from diets. Consequently, studies on alternative products that can result in improved feed utilization, promotion of growth and maintenance of intestinal health are taking place (Zhang et al., 2005).

Zafarnejad et al. (2017) studied the effect of supplementing diet with propolis on broiler chicks (male Ross 308) performance. They found that the highest body weight (BW), average daily feed intake (ADFI), average daily gain, carcass weight, and carcass yield were significantly ($p<0.05$) higher in broilers fed diets with propolis (800 $mg.kg^{-1}$) compared to the control group. El-Neney and El-Kholy (2014) showed that the body weight and body weight gain were higher with bee-pollen supplementation. This may be due to improved crude protein digestibility, antibacterial, antioxidant, and improved nutrient utilization due to the presence of flavonoids. Wang et al. (2007) proved that bee-pollen improves the digestion and absorption of broilers. They stated that this was accomplished through the development of thicker and longer villi. This was in association with an increase in body weight gain due to higher positive protein metabolism (Attia et al., 2011). Han et al. (2010) reported that the water treatment with bee-venom resulted in significantly higher body weight gain (BWG) than in the control group. The average daily weight gain from d 1 to 28 was higher for birds supplemented with bee-venom compared to control birds. The aim of this study was to evaluate the effect of using bee products (propolis, pollen and venom) and a growth promoter (Biox-Y®) on productive and physiological performance in broiler chickens (Cobb 500), to produce safer chicken products for human consumption.

MATERIALS AND METHODS

This study was carried out at the Poultry Unit, Agricultural Experimental station, Faculty of Agriculture, Cairo University, Giza, Egypt. A total of 408 unsexed one week old Cobb 500 broilers were randomly divided into 8 equal experimental treatments with 3 replicate of 17 chicks each. Chicks were placed in an open sided house, under similar natural environmental conditions of the season (December 2015 to January 2016), with a brooder temperature started at 30°C and was reduced every week until 24°C. The relative humidity ranged from 58 to 62%. The birds were exposed to 23 h of light and 1 h darkness. Water and feed were provided ad libitum. Birds were vaccinated against infectious Avian Influenza, Newcastle disease and Infectious bursal disease (IBD, Gumboro) at the time of placement.

Experimental design:

Basal diet (Table 1) was a commercial broilers diet, which the starter diet (7-21 days of age) contained 23% protein and 3000 Kcal ME/Kg, also the finisher diet (22-49 days of age) contained 19% protein and 3200 Kcal ME/Kg. The basal diet was supplemented with the required vitamins, minerals and amino acids according to the NRC (1994). The second treatment was fed the basal diet supplemented with the growth promoter Biox-Y® 0.5g per kg of diet, which it's containing of a) dried yeast cell walls (Saccharomyces cerevisiae) containing Mannan oligosaccharide 18% and Beta Glucan 20%. b) Carrier: Silicates containing Calcium silicates 36%, Sodium aluminium silicate 32%, and Silicic acid 12%, it is produced by Biochem Co., Germany. The third and the forth treatments (chemical composition of propolis accorging to Christov et al., 1998) were fed basal diet supplemented with propolis (200 or 400 mg/kg diet), respectively. The fifth and the sixth treatments (chemical composition of bee-pollen according to Campos et al., 2010) were fed basal diet supplemented with bee-pollen (1 or 2 g/kg diet), respectively. The seventh and the eighth treatments (composition of bee-venom according to Urtubey, 2005) were fed basal diet without any additives, but their water was supplemented with bee-venom (1 or 2 mg/L water) respectively.

Measurements:

All birds were individually fasted then weighed weekly permitting the calculation of weekly body weight gain. Feed Intake was calculated weekly for each replicate and then the feed conversion ratio was calculated at weekly intervals.

At the end of the experiment (at 7 weeks of age), blood samples were collected (withdrawn) from the brachial vein in heparinized plastic tubes, then centrifuged at 4000 rpm/min for 10 minutes, (2 samples per replicate X 3 replicate X 8 treatments), total of 48 samples. Plasma were decanted and stored at -20 °C in 3-mL eppendorf tubes for subsequent analyses. Plasma total cholesterol (Allain et al., 1974), plasma LDL-cholesterol (Wieland and Seidel, 1983), plasma HDL-cholesterol (Lopes-Virella et al., 1977), calcium (Gindler and King, 1972), phosphorus (El-Merzabani et al., 1977), glucose (Trinder, 1969), aspartate aminotransaminase (AST) and alanine aminotransaminase (ALT) (Reitman and Frankel, 1957), total lipids (Zollner and Kirsch, 1962), creatinine (Schirmeister et al., 1964), uric acid (Tiffany et al., 1972), Triiodothronine (T3) (Pagana and Pagana, 2011) and Thyroxine (T4) (Nelson and Wilcox, 1996) using commercial kits produced by Biodiagnostic Company, U.K.

Statistical analysis:

One-way analysis of variance for the data collected was done using the SAS General Linear model procedure (SAS Institute, 2004). Mean values were compared using Duncan's multiple rang test (Duncan, 1955) when significant differences existed. The significance level was set at 5%.

RESULTS AND DISCUSSION

a) Productive performance measurements:

1. Body weight and body weight gain

The results displayed in Table 2 indicates that the chicks fed diet with propolis (400 mg/kg diet) had significantly higher body weight (BW) and total body weight gain (TBWG) compared to all other treatments. The Biox-Y® treatment was significantly less than the control treatment.

These results are in agreement with Shreif and El-Saadany (2017), when they were studying the effects of supplementing diet with propolis on Bandarah chicks performance. They observed that BW and BWG significantly ($p<0.01$) increased with the increase in propolis level (150, 300 and 450 mg/kg diet) during the experimental period. Also, Babaei et al. (2016) found that supplemented diet with propolis (1000 or 5000 mg/kg diet) resulted in significant increase in live body weight. Additionally, El-Neney et al. (2016) found that using propolis at 100, 200 and 300 mg/kg diet for Dokki4 chicks significantly increased their BW and BWG.

Canogullari et al. (2009) suggested that the mode of action of propolis may be due to a strong effect of antibacterial action, also related to the presence of micronutrients with positive effects on metabolism and bird's health, and therefore improvement in broiler performance.

Present results are in contradictory to the findings of Mahmoud et al. (2017), who reported that propolis supplementation (100, 250, 500, 1000 and 3000 mg.kg^{-1}) did not affect the BW and BWG of broiler chicks, compared with birds fed the control diet.

Bee-venom (1 or 2 mg/L water) and bee-pollen (1 or 2 g/kg diet) treatments did not significantly affect the BW and BWG compared to the control group. However, bee-pollen (1 or 2 g/kg diet) and bee-venom (1 mg/L water) treatments were significantly ($p<0.01$) better than the Biox-Y® treatment. These results are in agreement with Farag and El-Rayes (2016), when studying the effect of supplementing diet with bee-pollen on broiler chicks performance. They observed that BW and BWG were significantly higher during the experimental period. The nutritive value of the bee-pollen could have caused these positive improvements. The bee-pollen is a good source of protein, essential amino acids, fat, unsaturated fatty acids, carbohydrates and minerals.

Wang et al. (2007) proved that bee-pollen improves the digestion and absorption of broilers. They stated that this was accomplished through the development of thicker and longer villi. This was in association with an increase in BWG due to higher positive protein metabolism (Attia et al., 2011).

Wang et al. (2006) found that layer diets supplemented with 1.5% BP could improve the tissues structure of the digestive tract, then the digestion and absorption function of body were increased. On the other hand, Canogullari et al. (2009) reported that the pollen supplementation did not result in any significant improvement in growth performance and body components of quail. Han et al. (2010) indicated that bee-venom supplementation in the drinking water, improved body weight gain in broiler chicks. They also reported that the water treatment with bee-venom resulted in significantly higher BWG than in the control group.

2. Feed intake and feed conversion

The average amount of daily feed intake per chick during the experimental period are present in Table 2. Biox-Y® treatment and all natural supplements; propolis (200 or 400 mg/kg diet), bee-venom (1 or 2 mg/L water) and bee-pollen (1 or 2 g/kg diet) treatments had significantly lower average daily feed intake during the experimental period compared to the control treatment. All natural supplements, also, significantly improved their total feed conversion ratios compared to the control and Biox-Y® treatments.

These results are in agreement with Roodsari et al. (2004) who showed that the chicks fed a diet with propolis (250 mg/kg diet) were characterized by significantly lower feed intake per kg body weight gain, compared to the birds that received diets without propolis supplements. Also, Zeweil et al. (2016) studying the effect of supplementing diet with propolis (500 mg/kg diet) on Japanese quail chicks performance, observed significant ($P \leq 0.05$) decrease in feed intake for groups that received 500 mg propolis in their diet as compared with the control group.

Haščik et al. (2015) showed that the feed conversion ratio (FCR) in the experimental groups (200, 300 or 400 mg propolis/kg diet) were improved compared to the control group. These results in-agreement with Daneshmand et al. (2012) who found that the propolis improved FCR on broiler chickens. The reason which led propolis to the improve the growth performance of the broilers is because propolis improves the digestive utilization of iron and the regeneration efficiency of haemoglobin (Hb), especially during recovery from an anemic syndrome.

The present results are in contrast with the findings of Ozkok et al. (2013) who noticed that inclusion propolis in layers diet, at 100, 200 and 400 mg/kg did not affect feed intake. Açikgöz et al. (2005) also, reported that the propolis supplementation (500 or 2000 ppm) did not significantly improve FI and FCR of male broilers compared to the control group. They also stated that dry matter and organic matter digestibility were not affected by propolis. However, propolis supplementation to the starter diet improved ether extract digestibility. On the other hand, propolis supplementation to the starter diet had adverse effects on crude protein digestibility during the grower phase.

Farag and El-Rayes (2016) found that feed intake decreased significantly for birds receiving bee-pollen in their diets. Similarly, feed conversion in birds received bee-pollen diets significantly improved compared with the birds fed the control diet. Better feed conversion and lower feed intake might be due to the bee-pollen contents. Bees add different enzymes and coenzymes to the bee-pollen pellets, which may add cell growth and improve broilers digestion (Wang et al., 2007). On the contrary, Haščík et al. (2012) reported that bee-pollen increased FI of broiler chickens.

Han et al. (2010) reported that the water treatment with bee-venom resulted in numerically higher FI, although not significantly higher, for birds supplemented with bee-venom than control birds. A positive correlation between BWG and improved FI was noted, and observed it in other drinking water supplementation studies (Ahmad et al., 2008).

b) Physiological performance:

1. Plasma total cholesterol, LDL and HDL concentration (mg/dl)

The results displayed in Table 3 indicates that at the end of experiment (7-week) treatments with propolis (200 or 400 mg/kg diet) or bee-venom (2 mg/L water) or bee-pollen (2 g/kg diet) were significantly lower plasma cholesterol and LDL-cholesterol (Low-density lipoproteins cholesterol) concentration compared to the control treatment. On the other hand, propolis (200 or 400 mg/kg diet) treatments and bee-pollen (2 g/kg diet) treatments had significantly higher plasma HDL cholesterol (High-density lipoproteins cholesterol) concentration compared to the control group. Also, no changes of plasma HDL cholesterol levels by addition of bee-venom (1 or 2 mg/L water) were observed.

These results are in agreement with Zafarnejad et al. (2017). They also found that the levels of cholesterol, LDL, and LDL:HDL ratio were significantly lower for broilers fed diet with propolis (900 $mg.kg^{-1}$) compared with birds fed the control diet.

Denli et al. (2005) reported that broilers that received Turkish propolis in their diet tended to have higher serum HDL and lower serum LDL. Freitas et al. (2011) also observed that the enhancement of serum HDL by the addition of 100 mg/kg ethanolic extract of propolis, that was observed, might be due to the reduction of enzyme syntheses activities.

Serum cholesterol levels showed significant ($p<0.001$) decrease in broilers fed diet contains bee pollen compared with the control (Farag and El-Rayes, 2016). The decrease in serum cholesterol level may be due to bee-pollen content of unsaturated acids; linoleic, oleic, and linolenic that prevents the accumulation of lipid peroxidation product. Xu et al. (2009) stated that the lower plasma cholesterol level could be due to its content of phospholipids and polyunsaturated fatty acids, particularly linolenic acid. Also Attia et al. (2014) reported that bee-pollen supplementation decreased the cholesterol level in broilers.

The present results are in contrast with the findings of Han et al. (2010), who reported no significant effects of bee-venom supplementation on total cholesterol. At the same time, no major organ damages were seen with bee-venom supplementation in the drinking water. However, bee-venom did decrease total cholesterol and triglyceride content in mice with atherosclerotic lesions when a physiologically optimal level of bee-venom was administered (Lee et al., 2010).

2. Plasma calcium, phosphorus and glucose levels (mg/dl)

The results displayed in Table 4 indicates that after 6 weeks of treatments, no changes in plasma calcium, phosphorus or glucose of broilers fed diet with propolis (200 or 400 mg/kg diet), bee-pollen (1 or 2 g/kg diet) or drinking water with bee-venom (1 or 2 mg/L) were observed. However, only plasma calcium was significantly lower, when the birds were treated with bee-venom compared to the control treatment.

These results are in agreement with Mahmoud et al. (2017) who reported that no changes in serum calcium, phosphate and glucose in propolis fed broilers (250, 500, 1000 and 3000 $mg.kg^{-1}$ diet) compared to the control group. Galal et al. (2008) also, reported that propolis supplementation (100 or 150 mg/kg diet) increased plasma calcium and phosphorus of laying hens, compared to the control group. However, this difference was not statistically significant.

Oliveira et al. (2013) reported that bee-pollen inclusion in broiler diets did not affect the evaluated bone characteristics. It was expected that the bones of birds fed diets containing bee-pollen would have higher calcium content, but this did not happen. On the other hand, the vitamin D content of bee-pollen (Zuo & Xu, 2003) improves the absorption of calcium for the small intestine. Bee-pollen expands the intestinal surface and this enhances calcium absorption (Wang et al., 2007).

Our results are in contrast with the findings of Haščik et al. (2015), who found improvement in plasma glucose tolerance of chicks fed diet containing propolis. This might be because the propolis contains flavonoids. El-Neney and El-Kholy (2014) indicated that the increase in plasma glucose, as a result of bee-pollen supplementation, is within the normal range and may indicate increasing energy availability (sugars) for physiological and biochemical functions. El-Said et al. (2007) showed that treatment with bee-pollen caused marked increases in plasma glucose. Abou El-Naga (2014) reported a significantly increased (P≤0.05) in serum glucose for Norfa laying hens fed diet with bee-pollen supplementation, compared with birds fed the control diet.

3. Serum ALT and AST concentrations (U/ml)

Serum ALT and AST concentrations are presented in Table 5. It is obviously clear that, broilers fed propolis (200 or 400 mg/kg diet) for 6 weeks had significantly lower serum aspartate amino transferease (AST) and alanine amino transferease (ALT) concentrations compared to the control or Biox-Y® treatments. Also, bee-venom (1 or 2 mg/L water) treatments had significantly lower serum AST compared to the control treatment. On the other hand, no changes in serum AST and ALT were observed by the addition of bee-pollen (1 or 2 g/kg diet) compared to the control treatment.

These results are in agreement with Shreif and El-Saadany (2017), who reported significantly (p<0.01) lower in serum AST and ALT activity by including propolis in chicks diets. The same results were observed with Galal et al. (2008) who showed that AST and ALT activities were significantly reduced by adding propolis to layer ration at 100 and 150 mg/kg diet. Similarly, Abdel-Kareem and El-Sheikh (2015) reported reductions in the liver enzymes (AST and ALT) when laying hens were fed diets containing by propolis at 250, 500 and 1000 mg/kg. The decrease in serum transaminases activities may be attributed to higher biological activity and nutritive values of propolis, which could prevent lipid peroxidation (Shreif and El-Saadany, 2017).

Mahmoud et al. (2017) reported that propolis supplementation, regardless of dose, significantly reduced serum AST concentration, in broilers in comparison to control birds. Improving AST concentration may be attributable to the protective effects of propolis on the liver from its phenolic components and their anti-oxidant effects inhibiting lipid oxidation in cell membranes (Babinska, et al., 2013).

Mahmoud et al. (2017) showed that propolis, regardless of dose, significantly inhibited heat stress-induced increase of AST in broiler chickens. Propolis protected tissue damage, resulted in reduced AST concentration. This was also observed in laying hens fed propolis at 100 or 150 $mg.kg^{-1}$ (Galal et al., 2008) and broilers fed 300 $mg.kg^{-1}$ propolis (Hosseini-Vashan et al., 2012) under regular management conditions. Conversely, Seven et al. (2010) reported that propolis had no effects on AST concentration in broiler chickens exposed to heat stress or lead toxicity.

El-Neney and El-Kholy (2014) reported that bee-pollen supplementation in rabbits diets had no significant effects on AST and ALT levels among all the groups (0, 200, 300 and 400 mg BP/kg). Also, they reported no adverse effects of bee-pollen administration on liver function. This may indicate that bee-pollen treatment is safe for the liver functions and it had no harmful effect on liver tissues. Also, they indicated the protective effect of bee-pollen upon some organs such as liver and brain may be due to its contents of some flavonoids, which play a role as antioxidant against oxidative material which caused damage to such organs.

4. Plasma total lipid concentration (mg/dl)

The results of the present study in Table 5 indicates that after 6 weeks of feeding propolis (200 mg/kg diet), bee-pollen (2 g/kg diet) or bee-venom (2 mg/L water) resulted in significantly lower plasma total lipids concentration compared to the control and Biox-Y® treatments.

These results are in agreement with Zafarnejad et al. (2017) who found that the levels of triacylglycerides, cholesterol, LDL, and LDL:HDL ratio were significantly decreased for broilers fed diet containing propolis (900 $mg.kg^{-1}$) compared with birds fed the control diet. The lower plasma lipids and cholesterol levels can be due to phospholipids and PUFA, particularly linolenic acid (Xu et al., 2009).

Zeweil et al. (2016) reported that feeding a diet with propolis (500 mg/kg diet) to Japanese quail chicks resulted in significant ($P \leq 0.05$) decrease in serum total lipids compared to quail fed control diet. Attia et al. (2013) also, reported that rabbits fed diet with bee-pollen had significantly lower plasma total lipids compared with a control group.

Flavonoids and various phenolics in propolis have appeared to be capable of scavenging free radicals and thereby protecting lipids and other compounds from being oxidized or destroyed during oxidative damage (Seven et al. 2009). Besides, flavonoids inhibit lipid peroxidation, platelet aggregation, capillary permeability and fragility (Havsteen, 2002).

Attia et al. (2014) found that total lipids and cholesterol were significantly ($P<0.05$) lower in rabbit groups that were supplemented with bee-pollen. The significant ($P<0.05$) decrease in total lipids and cholesterol values, as a result of bee-pollen supplementation may be due to the main effective unsaturated acids oleic, linoleic (omega-6) and linolenic (omega-3) that inhibits accumulation of lipid peroxidation product. The decrease in plasma lipid may indicate a depletion of energy source to maintain body temperature. El-Neney and El-Kholy (2014) also, reported that plasma total lipids and cholesterol were significantly ($P<0.05$) decreased when Dokki4 chickens were supplemented with bee-pollen at different levels comparing with the control.

Our results are in contrast with the findings of Abou El-Naga (2014) who reported that bee-pollen supplementation (1 and 2% BP) in laying hens diets had no significant effect among treatments groups on serum total lipids in Norfa laying hens as well as on serum total lipids in Norfa cocks.

Han et al. (2010) reported no significant effects of bee-venom supplementation on total cholesterol, AST or ALT. Bee-venom supplementation in the drinking water caused no major organ damages. However, globulin level was higher with the high-dose (2.5 mg/kg) of bee-venom application to piglets (Han et al., 2009). Also, they postulated that bee-venom requires a high dose to elicit any physiological effects.

5. Plasma Creatinine and Uric acid concentration (mg/dl)

The results of Table 6 indicates that feeding broilers for 6 weeks diets supplemented with propolis (200 mg/kg diet) or bee-pollen (1 g/kg diet) resulted in a significantly lower plasma creatinine and uric acid concentration compared to the control treatment. Also, bee-pollen (1 or 2 g/kg diet) treatments significantly resulted in a lower plasma creatinine concentration. However, no changes in plasma uric acid levels were observed in comparison with the control treatment.

On the other hand, bee-venom treatment (1 mg/L water) had significantly higher plasma uric acid concentration. However, no changes in plasma creatinine levels were observed compared to the control treatment. Bee-venom treatment (2 mg/L water) resulted in significantly higher plasma creatinine concentration. However, no changes in plasma uric acid levels were observed compared to the control group at that level of treatment.

These results are in agreement with Mahmoud et al. (2017), who reported that propolis supplementation (250, 500, 1000 and 3000 $mg.kg^{-1}$) significantly ($p<0.05$) reduced serum uric acid concentration, compared to the control group. Yoshizumi et al. (2005) postulated that this may be attributed to the xanthine oxidase inhibitory activity of propolis bioactive contents.

Improvements in uric acid and AST concentration may be attributable to the protective effects of propolis on the liver and the kidney due to its phenolic components and their anti-oxidant effects inhibiting lipid oxidation in cell membranes (Babinska et al., 2013).

However, our results are in contrast with the findings of Denli et al. (2005), who reported no differences in serum uric acid concentration between propolis treated quail (0.5, 1 or 1.5 g/kg) and the controls under thermo-neutral environmental conditions.

Serum uric acid and creatinine levels were significantly ($p<0.001$) lower in broilers fed diet contains bee-pollen compared to the controls (Farag and El-Rayes, 2016). Their findings indicated that bee-pollen, fed to broilers, improved the filtration rate of the kidney. These results are in agreement with the findings of Attia et al. (2014), they stated that bee-pollen can reduce urea-N and creatinine concentrations in broilers chickens fed diet supplemented with bee-pollen in comparison with the control group.

6. Thyroid hormones (T3 & T4) concentration (ng/dl)

The results displayed in Table 7 indicate that after 6 weeks of feeding the broiler chicks propolis (400 mg/kg diet) had significantly higher plasma Triiodothronine (T3) and Thyroxine (T4) concentration and T3/T4 ratio were observed compared to the control treatment. On the other hand, no changes were found in plasma T3 and T4 concentration or the T3/T4 ratio of bee-pollen and bee-venom fed treatments compared to the control treatment.

These results are in agreement with Mahmoud et al. (2017), who reported that broilers fed diet with propolis supplementation (250 $mg.kg^{-1}$) had a significant increased T3/T4 ratio, compared to the control group and other propolis treated groups. The 250 $mg.kg^{-1}$ propolis fed group may have a higher T4 to T3 conversion, resulting in a lower concentration of T4 but a higher concentration of T3 than the controls.

Attia et al. (2013) reported that plasma T3 was significantly lower in the bee-pollen supplemented-group than only those supplemented with bee-pollen with propolis. Also, plasma T4 was significantly lower of bee-pollen supplemented group than the control group. They found no significant differences due to bee-pollen on T3/T4 ratio. Our results are in contrast with the findings of Ludyanskii, (1994), who observed that the bee-venom showed increased secretion of thyroid hormones.

CONCLUSION

It can be concluded that it is recommended to add propolis (400 mg/kg diet) or bee-pollen (2 g/kg diet) to broilers diets or to add bee-venom (2 mg/L water) to Cobb broilers drinking water. This is an eco-friendly alternative to replace the use of antibiotics in broilers feed. This may result in improve productive and physiological performance for broiler chickens.

Table (1): Composition and calculated analysis of the basal diet fed to the experimental birds

Ingredients (%)	**Starter (7 – 21 day)**	**Finisher (22 – 49 day)**
Yellow corn	43.69	56.05
Soybean (46% CP)	26.40	--
Soybean (44% CP)	--	33.00
Wheat bran	10.00	--
Corn gluten 60%	5.00	--
Full fat soya	5.00	--
Dried corn dist.	3.00	--
Soya oil crude	2.80	7.20
Di-calcium phosphate	2.00	1.70
Limestone	1.10	1.10
Premix* (Vitamin & Minerals)	0.30	0.30
L Lysine HCL	0.23	--
DL-Methionine	0.18	0.27
Salt	0.30	0.38
Total	100	100
Calculated chemical analysis (%)**		
Crude protein	23.208	18.99
Crude fiber	3.407	3.698
Crude fat	6.441	9.824
Calcium	0.962	0.891
Available phosphorus	0.526	0.462
Lysine	1.316	1.107
Methionine	0.601	0.590
Cysteine	0.196	--
Met.+cysteine	0.979	0.902
Sodium	0.156	0.163
ME (Kcal/ Kg diet)	3019.8	3226.06

* Supplied per kg of diet: Vit. A, 13000 IU; Vit. D_3, 5000 IU; Vit. E, 80 mg; Vit. K_3, 4 mg; Vit. B1, 5 mg; Vit. B2, 9 mg; Vit. B6 4 mg; Vit. B12, 0.020 mg; Niacin. 60 mg; Pantothenic acid, 15 mg; Folic acid, 2 mg; Biotin, 0.15 mg; Choline, 400 mg; Copper, 20 mg; Iron, 50 mg; Managanese, 100 mg; Zinc, 100 mg; Calcium carbonate, 300 mg; Iodine, 1.3 mg; Selenium, 0.2 mg; Cobalt, 0.2 mg.

** According to NRC (1994)

Table (2): Effect of some honey bee products and a growth promoter (Biox-Y®) supplementation on final body weight, total body weight gain, average daily feed intake and total feed conversion ratio of Cobb 500 broilers at 7 weeks of age

Traits \ Treatments	Control	Biox-Y®	Propolis		Bee Pollen		Bee Venom		P-value
		0.5 g/kg diet	200 mg/kg diet	400 mg/kg diet	1 g/kg diet	2 g/kg diet	1 mg/L water	2 mg/L water	
Final weight (g)	2323^{bc} ±51	2126^{d} ±36	2364^{b} ±50	2536^{a} ±53	2193^{cd} ±50	2284^{bc} ±42	2383^{b} ±56	2254^{bc} ±40	<0.0001
Total body weight gain	2140^{bc} ±50	1944^{d} ±35	2185^{b} ±51	2356^{a} ±53	2010^{cd} ±50	2100^{bc} ±41	2199^{b} ±56	2073^{bcd}±39	<0.0001
Average daily feed intake (g/chick/day)	120^{a} ±0.3	109^{bc} ±1.8	109^{bc} ±0.9	112^{b} ±3.4	102^{d} ±1.5	110^{bc} ±2.7	111^{bc} ±0.6	109^{cd} ±1.7	<0.0003
Total feed conversion ratio (kg feed:kg gain)	2.37^{ab} ±0.07	2.42^{a}±0.02	2.12^{cd}±0.11	1.95^{d}±0.06	2.14^{cd}±0.10	2.21^{bc}±0.05	2.13^{cd}±0.05	2.15^{c}±0.03	<0.0040

^{a,b,c,d} Means followed by different superscripts, between treatments within trait, differ significantly (P<0.05)

Table (3): Influence of some honey bee products and a growth promoter (Biox-Y®) supplementation on plasma total cholesterol, LDL and HDL on Cobb 500 chicks at the end of experiment

Traits \ Treatments	Control	Biox-Y®	Propolis		Bee Pollen		Bee Venom	
		0.5 g/kg diet	200 mg/kg diet	400 mg/kg diet	1 g/kg diet	2 g/kg diet	1 mg/L water	2 mg/L water
TotalCholesterol(mg/dl)	112.4^{a} ±1.9	114.5^{a} ±3.7	80.6^{c} ±5.1	97.8^{b} ±3.7	88.8^{bc} ±4.9	81.9^{c} ±4.9	115.8^{a} ±8.1	95.2^{bc} ±3.1
LDL (mg/dl)	47.4^{ab} ±9.6	50.1^{a} ±10.4	15.3^{d} ±4.3	18.5^{cd} ±3.2	30.3^{bcd} ±3.9	16.2^{d} ±1.8	37.6^{abc} ±5.6	23.5^{cd} ±5.9
HDL (mg/dl)	42.5^{c} ±1.9	50.3^{bc} ±9.0	68.1^{a} ±3.9	57.3^{ab} ±3.9	52.8^{bc} ±2.7	60.3^{ab} ±3.4	55.2^{abc} ±4.5	53.9^{abc} ±3.7

^{a,b,c,d} Means followed by different superscripts, between treatments within trait, differ significantly (P<0.05).

Table (4): Influence of some honey bee products and a growth promoter (Biox-Y®) supplementation on plasma calcium, phosphorus and glucose concentration of Cobb 500 chicks at the end of experiment

Treatments / Traits	Control	Biox-Y®	Propolis		Bee Pollen		Bee Venom	
		0.5 g/kg diet	**200** mg/kg diet	**400** mg/kg diet	**1** g/kg diet	**2** g/kg diet	**1** mg/L water	**2** mg/L water
Calcium (mg/dl)	11.4^{ab} ±0.15	10.6^{abc}±0.49	11.4^{ab} ±0.25	11.6^{a} ±0.27	10.45^{bc} ±0.4	10.41^{bc}±0.51	10.11^{c}±0.17	10.04^{c}±0.22
Phosphorus (mg/dl)	8.86^{abc}±0.26	8.77^{ab} ±0.32	9.78^{a} ±0.34	8.95^{abc}±0.41	9.14^{abc}±0.15	9.38^{ab} ±0.24	8.32^{bc}±0.34	8.28^{c} ±0.47
Glucose (mg/dl)	132.5^{abc}±5.9	120.9^{bc}±9.5	107.9^{c} ±8.08	124.8^{bc}±4.18	148.8^{ab}±10.9	111.3^{c}±11.65	162.7^{a}±19.5	155.1^{ab}±11.6

^{a,b,c} Means followed by different superscripts, between treatments within trait, differ significantly (P<0.05).

Table (5): Influence of some honey bee products and a growth promoter (Biox-Y®) supplementation on AST, ALT and total Lipids levels of Cobb 500 chicks at the end of experiment

Treatments / Traits	Control	Biox-Y®	Propolis		Bee Pollen		Bee Venom	
		0.5 g/kg diet	**200** mg/kg diet	**400** mg/kg diet	**1** g/kg diet	**2** g/kg diet	**1** mg/L water	**2** mg/L water
AST (units/ml)	98.2^{a}±2.6	93.4^{abc}±2.5	89.9^{c}±1.0	90.1^{c}±1.1	95.2^{ab}±0.6	93.8^{abc}±1.1	90.9^{bc}±1.2	92.5^{bc}±1.3
ALT (units/ml)	12.48^{a}±0.5	10.63^{abc}±1.1	10.39^{bc}±0.36	9.72^{c}±0.25	12.28^{ab}±0.65	11.51^{abc}±0.65	11.90^{ab}±0.44	11.02^{abc}±0.75
Total Lipids(mg/dl)	361^{a}±15	360.5^{a}±26	245.3^{d}±30	326^{abc}±18	348.8^{ab}±33	267.4^{cd}±5.9	323.9^{abc}±19	283.5^{bcd}±10.4

^{a,b,c,d} Means followed by different superscripts, between treatments within trait, differ significantly (P<0.05).

Table (6): Influence of some honey bee products and a growth promoter (Biox-Y®) supplementation on plasma Creatinine and Uric acid concentration of Cobb 500 chicks at the end of experiment

Treatments / Traits	Control	**Biox-Y®**	**Propolis**		**Bee Pollen**		**Bee Venom**	
		0.5 g/kg diet	**200** mg/kg diet	**400** mg/kg diet	**1** g/kg diet	**2** g/kg diet	**1** mg/L water	**2** mg/L water
Creatinine (mg/dl)	$1.20^{b}\pm0.04$	$1.26^{ab}\pm0.07$	$0.91^{c}\pm0.04$	$1.28^{ab}\pm0.15$	$0.77^{c}\pm0.09$	$0.86^{c}\pm0.03$	$1.36^{ab}\pm0.13$	$1.52^{a}\pm0.08$
Uric Acid (mg/dl)	$3.94^{bcd}\pm0.33$	$2.77^{cde}\pm0.89$	$2.07^{e}\pm0.30$	$4.08^{bc}\pm0.65$	$1.73^{e}\pm0.68$	$2.34^{de}\pm0.45$	$5.81^{a}\pm0.42$	$4.61^{ab}\pm0.44$

[a,b,c,d] Means followed by different superscripts, between treatments within trait, differ significantly ($P<0.05$).

Table (7): Influence of some honey bee products and a growth promoter (Biox-Y®) supplementation on T3 and T4 concentration of Cobb 500 chicks at the end of experiment

Traits / Treatments	**Triiodothronine (T3)** (ng/dl)	**Thyroxine (T4)** (ng/dl)	**T3/T4 ratio**
Control	$23.60^{bc}\pm0.75$	$21.20^{b}\pm1.02$	$1.18^{b}\pm0.08$
Biox-Y® (0.5 g/ kg diet)	$24.60^{bc}\pm1.33$	$22.0^{ab}\pm1.05$	$1.13^{b}\pm0.06$
Propolis (200 mg/kg diet)	$26.0^{b}\pm0.32$	$21.4^{ab}\pm0.51$	$1.22^{ab}\pm0.03$
Propolis (400 mg/kg diet)	$32.20^{a}\pm1.07$	$24.0^{a}\pm1.30$	$1.35^{a}\pm0.06$
Bee Pollen (1 g/kg diet)	$23.0^{c}\pm1.14$	$22.0^{ab}\pm 0.63$	$1.05^{b}\pm0.04$
Bee Pollen (2 g/kg diet)	$23.60^{bc}\pm0.68$	$21.20^{b}\pm0.37$	$1.11^{b}\pm0.04$
Bee Venom (1 mg/L water)	$22.60^{c}\pm0.51$	$21.40^{ab}\pm0.68$	$1.07^{b}\pm0.04$
Bee Venom (2 mg/L water)	$23.0^{c}\pm0.71$	$19.40^{b}\pm 0.75$	$1.18^{b}\pm0.05$

[a,b,c] Means followed by different superscripts, between treatments within trait, differ significantly ($P<0.05$).

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الملخص العربى

تاثير اضافة بعض منتجات نحل العسل ومنشطات النموعلى الآداء الانتاجى والفسيولوجى فى دجاج التسمين

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أستخدم في هذه الدراسة 408 كتكوت تسمين Cobb عمراسبوع حتى 7 أسابيع حيث تم تقسيمهم عشوائيا الى 8 مجاميع وكل مجموعة تم تقسمها الى 3 مكررات كل مكرر يحتوى على 17 كتكوت وتم معاملة هذه المجاميع كما يلى :

- المعاملة الاولى وهى الكنترول (Control) وهى لا تحتوى العليقة على اى اضافات.
- المعاملة الثانية وهى كنترول + منشط النمو التجارى Biox-Y® بمعدل 0.5جم /كجم علف.
- المعاملة الثالثة والرابعة تم اضافة مادة البروبليس بمعدل 200 أو 400 ملجم / كجم علف على التوالى.
- المعاملة الخامسة والسادسة تم اضافة مادة حبوب اللقاح بمعدل 1 أو 2 جم / كجم علف على التوالى.
- المعاملة السابعة والثامنة تم اضافة مادة سم النحل بمعدل 1 أو 2 ملجم / لتر ماء شرب على التوالى.

وخلال التجربة تم أخذ بعض القياسات الانتاجية مثل وزن الجسم النهائى واستهلاك العلف اسبوعيا وتم حساب الكفاءة التحويلية وتم فى نهاية التجربة أخذ عدد 6 عينات دم من كل مجموعة وذلك لتقدير بعض القياسات الفسيولوجية.

وتتلخص النتائج فيما يلى:

حدث زيادة معنوية فى كلا من وزن الجسم والزيادة الكلية فى وزن الجسم فى المعاملة التى اخذت البروبليس بمعدل 400 مجم / كجم علف بالمقارنة بالكنترول او المعاملة التى تناولت منشط النمو Biox-Y®. كما لوحظ انخفاض معنوى فى متوسط استهلاك العلف اليومى لمعاملات البروبليس وحبوب اللقاح وسم النحل ومعاملة Biox-Y® وذلك بالمقارنة بالكنترول. وكذلك تم الحصول على كفاءة تحويلية افضل فى كل المعاملات وذلك بالمقارنة بالمعاملات التى اخذت منشط النمو والكنترول.

لوحظ انخفاض معنوى فى تركيز الكولستيرول بالبلازما لمعاملات البروبليس وحبوب اللقاح ومعاملة سم لنحل (2 ملجم/لتر ماء شرب) وذلك بالمقارنة بالكنترول أو معاملة منشط النمو. ايضا انخفض معنويا تركيز LDL لمعاملات البروبليس وحبوب اللقاح (2 جم / كجم علف) ومعاملة سم النحل (2 ملجم / لتر ماء شرب) وذلك بالمقارنة بالكنترول أو معاملة منشط النمو. وبالتبعية ارتفع معنويا تركيز HDL لمعاملات البروبليس ومعاملة حبوب اللقاح 2 جم / كجم علف وذلك بالمقارنة بالكنترول. كما انخفض معنويا تركيز انزيمات الكبد AST & ALT بالبلازما لمعاملات البروبليس وذلك بالمقارنة بالكنترول أو معاملة منشط النمو. كما ارتفع معنويا مستوى هرمونات الغدة الدرقية T3 , T4 فى معاملة البروبليس بمعدل 400 مجم / كجم علف وذلك بالمقارنة بمعاملة الكنترول أو معاملة منشط النمو.

نستخلص من هذه الدراسة انه يمكن استخدام البروبليس (400 ملجم/ كجم علف) او حبوب اللقاح (2 جم/ كجم علف) أو سم النحل (2 ملجم / لتر مياه شرب) كبدائل طبيعية فى تغذية دجاج التسمين واحلالها محل منشطات النمو حيث ادت الى زيادات معنوية فى وزن الجسم النهائى وتحسين كفاءة تحويل العلف والاداء الفسيولوجى.