

EFFECT OF DIETARY BEE HONEY AND BEE POLLEN AS ALTERNATIVE OF ANTIBIOTIC ON GROWTH PERFORMANCE, TIBIA CHARACTERISTICS AND SOME BLOOD PLASMA PARAMETERS OF BROILERS

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SUMMARY

An experiment was conducted to evaluate the effects feeding broiler chicks on corn soybean meal diets supplemented with bee honey (BH), bee pollen (BP) or both as alternative to antibiotics erythromycin (ER) on growth performance, tibia characteristics and some blood plasma parameters. A total of number 150 one - day old chicks of (Cobb) strain were randomly assigned to five dietary treatments (5 treatments x 3 replicate groups x 10 chicks in each group). The treatments were: control without supplementation; T1 (ER) 0.0275%; T2 (BH) 0.10%; T3, (BP) 0.05% and T4 (BH, 0.10% + BP 0.05). The main results showed significant effect on body weight, body weight gain and performance index. On contrary there were no significant effect on feed consumption and feed conversion ratio within treatments. The results showed no significant effect on tibia measurements tibia weight (wet and dry), tibia (width and length) and tibia seeder index while there was significant effect on tibia breaking strength, As most of measured parameters there were no significant effect on tibia chemical composition (ASH and P) except (Ca) between treatments.

Keywords: *bee honey, bee pollen, antibiotics, growth performance.*

INTRDUCTION

Antibiotic growth promoters (AGPs) have been used for around 60 years in agricultural animal production to enhance growth performance and protect health of animals (Goodarzi *et al.* 2014). Also, they have been supposed to enhance growth performance of poultry because it changes the intestinal tract, hence and improving absorptive capacity (Visek 1978). However, there are concerns that wider subtherapeutic use of AGPs in animal feed can lead to the development of antibiotic resistance in human pathogens, which is considered as a potential risk for humans if it is transferred from animal to human microbiota (Toghyani *et al.* 2015). Thus, poultry producers are looking for strategies to allow them to reduce or eliminate the use of AGPs in poultry production. Therefore, there is growing demand for alternatives to the subtherapeutic use of antibiotics which can sustain or improve broiler performance and the safety of poultry products.

Bee honey and bee pollen are substances had produced by honey bee, it can be regarded as a good food, Antimicrobial, antiviral and antiparasitic activity and anti-oxidant, because these functions result to that honey bee products including on many substance such as carbohydrate, protein, amino acid, minerals, vitamins, organic acids, Fatty acids Polyphenols, flavonoids (quercetin, luteolin, kaempferol, apigenin, chrysin, galangin), and phenolic acids (Gheldof and Engeseth 2002, Feas 2012).

Therefore, many researchers tried to find some natural feed additives such as Bee honey and bee pollen to be used in poultry farms to reduce the expected harmful effects, the results of many previous reports demonstrated that bee products has a beneficial influence on body weight gain (BWG), feed consumption (FC), feed conversion ratio (FCR), and productive performance in different poultry species (Osunkeye *et al.*, 2016, Hegazi *et al.*, 2013 and Obun *et al.*, 2008). By contrast, other researchers did not find any positive effects of using dietary bee products on growth performance of broiler chicks (Hosseini *et al.*, 2016 and Monsuru *et al.*, 2012).

Therefore, feeding trials were conducted to investigate the supplementation of bee products (bee honey (BH), bee pollen (BP), or both as an alternative to AGPs erythromycin (ER) on growth performance, some tibia measurements and composition and some blood parameter.

MATERIAL AND METHODS

150 unsexed Cobb broiler chicks one-day-old were randomly distributed into (5 treatments x three 3 replicates x 10 chicks). Chicks were housed in battery cages and kept under similar environment during 1-35 days of age. Feed and water were supplied ad-libitum. Diets (Table 1) were formulated to be offered during the following periods; starter (1-14 d), grower (15-28 d) and finisher (29-35 d) diets. Bee honey (BH) and bee pollen (BP) were obtained from the Honey bee Research Section, Faculty of Agriculture, Ain Shams University, Egypt. Colistin sulfate (CS) used in this study was obtained from the local market.

The experimental treatments were as follows: The treatments were: control without supplementation; T₁ (ER) 0.275%; T₂ (BH) 0.10%; T₃, (BP) 0.05% and T₄ (BH, 0.10% + BP 0.05).

The diets were formulated to meet the nutrient requirements of the broiler chicks according to cobb broiler guide.

Table (1). Composition and calculated analysis of the starter, grower and finisher experimental basal diets.

Ingredient %	Starter (1-14 days)	Grower (15-28 days)	Finisher (29-35 days)
Yellow Corn	57.72	61.50	64.01
Soybean meal (44%)	30.00	28.00	25.25
Corn Gluten meal (60%)	6.30	4.00	4.00
Soybean Oil	1.80	2.60	3.20
Mono calcium phosphate	1.60	1.50	1.35
Limestone	1.45	1.35	1.25
L-lysine HCL	0.30	0.24	0.17
DL Methionine	0.23	0.21	0.17
Salt (Nacl)	0.30	0.30	0.30
Vit. & min. premix*	0.30	0.30	0.30
Total	100.00	100.00	100.00
Calculated chemical analysis*			
Crude protein %	22.01	20.03	19.03
ME (Kcal/kg)	3015	3090	3172
Calcium %	0.91	0.85	0.78
Available phosphorus %	0.45	0.43	0.39
Lysine %	1.33	1.19	1.06
Methionine%	0.61	0.55	0.50
Methionine + cysteine %	0.98	0.89	0.83

* Each 3Kg of premix containing: 15000000 I.U. Vit. A, 3000000 I.U. Vit. D 50g. Vit E, 3000mg Vit. K3. 3000 mg Vit. B1, 8000 mg. Vit B2, 4000 mg. Vit B6, 20mg. vit. B12, 15000 mg pantothenic acid, 60000 mg. niacin, 1500 mg. folic acid, 200mg. biotin, 200000 mg Vit C, 700 gm. choline chloride, 80 gm. Mn, 80 gm. zinc, 60 gm. iron, 10 gm. CU, 1 gm. Iodine, and 0.2 gm selenium, where CaCo₃ was taken as a carrier up to 3kg, the inclusion rate was 3Kg premix/ton feed. ** Calculated analysis of the experimental diets were done according to (NRC, 1994).

Growth performance

The performance parameters include live body weight (LBW), body weight gain (BWG), feed consumption (FC), feed conversion ratio (FCR), mortality number and performance index (PI) for each replicate for all treatments were determined.

Slaughter processing

At 35 d. of age, 4 birds close to average body weight of their respective treatments were selected for slaughtering.

Tibia characteristics

After slaughter processing the right tibia bone was collected and cleaned from soft tissues and weighed. The tibias were dried (105°C for 24 hrs) then weight and length and diameter of each tibia were measured using a digital caliper to the nearest mm. Tibia seedor index were calculated according to Seedor et al. (1991) and tibia breaking strength was determined by using the method prescribed by Flemming et al. (1998). Tibia composition % (ash, Ca and P) were performed using standard AOAC procedure (AOAC, 1995).

Blood plasma parameters

Blood samples from randomly taken four chickens of each treatment were immediately collected, during their exsanguination after slaughtering, into heparinized tubes and plasma were separated by centrifugation at 3000 rps for 15 minutes. Plasma constituents including calcium and phosphorus were determined calorimetrically by using spectrophotometer and suitable commercial diagnostic kits.

Statistical analysis

Data subjected to one-way analysis of variance using SAS (2001). Differences among means were detected by using Duncan's multiple range test (Duncan, 1955). The following model was Used:

$$Y_{ij} = G + T_i + e_{ij}$$

Where Y_{ij} = Observation for each dependent

Variable G = General mean.

T_i = Treatment effects ($i = 1, 2, \dots$ and 5).

e_{ij} = Random error.

RESULTS AND DISCUSSION

Productive performance

The impact of bee honey and bee pollen supplementation on LBW, BWG, FC, FCR, PI and mortality rate of Cobb broiler chicks are presented in Table (2). The averages of initial weight of broiler chicks at one-day of age were insignificantly different among all treatments. Final LBW recorded significant difference among treatments for chicks in the T_{1-4} that were significantly increased ($P < 0.05$) when compared to chicks of control groups (1569.08 g). The best LBW showed in T_2 and T_4 (1740.42 and 1779.06 g). Also, BWG showed similar trend, the best BWG showed in T_2 and T_4 (1703.32 and 1742.34 g). These results agreed with (Obun *et al.*, 2008; Hegazi *et al.*, 2013; Osunkeye *et al.*, 2016; Oyegunle *et al.*, 2016; Sakine *et al.*, 2016; Abuoghaba and Ismail 2018 and klaric *et al.*, 2018) they indicated that addition of BH or BP in broiler diets led to significant increases in LBW and BWG. But disagreed with (Monsuru *et al.*, 2012) who didn't found significant effects on LBW or BWG by bee honey addition in broiler diets.

Data in Table (2) Recorded that FC per chicks was decreased by feeding BH, BP or both (T_{2-3}) comparable to birds whose diet contained ER (T_1) or control diets. The corresponding figures were 2762.53, 2768.40 and 2799.73 g for (T_{2-4}) vs 2826.00 (T_1) 2811.00 g for control group, respectively without any significant differences. The figures of feed conversion ratio (FCR) indicated no significant effect among treatments, but better FCR value were detected for the chicks of diets supplemented with BH (T_2 , 1.62) or BH + BP (T_4 , 1.61), respectively. On the other hand, the worse FCR were found in chicks fed control (1.83) diets. The results showed significant effect in PI between treatments, the best result recorded in (T_2 , 107) and (T_4 , 109) compare to another treatments. These results agreed with (Monsuru *et al.*, 2012 and Hosseini *et al.*, 2016) who reported that the BH or BP supplementation had no significant effect on FC and FCR of broiler chicks compared with that of the control group, while disagreed with (Frag and El-Rayes, 2016 and Obun *et al.*, 2008) who reported that supplementation of bee honey or bee pollen had significant effect in FC and FCR in broiler chicks.

This improvement in broiler performance might be due to BH and BP contents; carbohydrates, vitamins (A, B₁, B₂, B₃ and biotin), enzymes, flavonoids, fatty acids and minerals, which are all important in growth performance enhancement and also, these findings can be attributed antimicrobial potential of the components of the BH and BP, resulting in better intestinal health and improving digestion and absorption (Matzke, 2003; Feas, 2012 and Bogdanov Pascoal *et al.*, 2014).

Table (2): Effect of dietary treatments on productive performance of broiler chicks.

Item	Treatment					SEM.	Sign.
	Control	T1	T2	T3	T4		
Initial weight	36.03	37.00	37.10	35.30	36.60	0.31	N. S
Live body weight (g)	1569.08 ^c	1709.11 ^{ab}	1740.42 ^a	1669.00 ^b	1779.06 ^a	22.30	*
Body weight gain (g)	1533.04 ^c	1672.11 ^{ab}	1703.32 ^{ab}	1633.31 ^b	1742.34 ^a	22.69	*
Feed consumption (g)	2811.00	2826.00	2762.53	2768.40	2799.73	35.61	N. S
Feed conversion ratio	1.83 ^a	1.67 ^b	1.62 ^b	1.69 ^b	1.61 ^b	0.03	N. S
Performance index	86.21 ^b	101.37 ^a	107.35 ^a	98.62 ^{ab}	110.86 ^a	10.87	*
Mortality rate	1/30	2/30	0/30	0/30	0/30		

a, b and c means in the same raw with different superscripts in the same raw are significantly ($p \leq 0.05$) different. N.S.: non-significant. Control: No additives, T1: ER (Erythromycin) 0.0275%, T2: BH (Bee honey) 0.10%, T3: BP (Bee pollen) 0.05% and T4: (BH + BP) 0.10% + 0.05. PI = Live body weight (kg) \ Feed conversion ratio * 100 (North, 1981).

Under the conditions of the present study all chicks appeared healthy and total mortality rate was 2.0% (3 chicks) during the total experimental period (35 days) and it seems that inclusion of different levels of bee honey and bee pollen or both (T₂₋₄) had positively influenced health conditions and mortality rate (Table). This result agreed with Obun *et al.* (2008); Hegazi *et al.* (2013) and Oyegunle *et al.* (2016) they reported that dietary supplementation of BH could reduce the mortality rate, this might be account for improving the immune response (Gheldof, 2002 and Hegazi *et al.*, 2013). In addition, BH stimulates the activity of leukocytes, stimulates lymphocytes proliferation and activates phagocytes, the honey stimulates monocytes to release cytokines, which are activators of immune response to infection. (Abuharfeil *et al.*, 1999).

The impact of bee honey and bee pollen supplementation on some tibia trait; measurements and chemical composition of broiler chicks are presented in Table (3) The achieved findings indicated that tibia weight (wet and dry) g, tibia (width, length and seedor index) for chicks treated with different dietary treatments were improved in birds of T₂₋₄ compare to those of ER and control groups. However, there were not any significant differences among treatments. While, significant differences in tibia breaking strength were detected among treatments, in which chicks fed diets supplemented with BH + BP (T₄, 28.25 cm/kg) were the highest compared with the other treatments.

The figures of tibia chemical composition indicated significant differences among treatments in Ca %, the best results showed in BH with or without BP (T₂ and T₄). On another hand, there were non-significant effect on ASH% and P% among treatments while, there were numerical improvements in T₂₋₄ groups compared to ER and control groups.

This result agreed with Mansurea *et al.* (2012), Oyegunle *et al.* (2016) and Rabie *et al.* (2018) they showed that addition of BH or BP in broiler diets improved the percentage of tibia weight and increased the percentage of calcium and phosphorus. These results might be due to improving calcium and phosphorus metabolism, as a result of the vitamin D content in BH and BP.

Results in Table (4) recorded that after 35 days of treatments, no changes in plasma calcium or phosphorus among treatments. However, numerically plasma Ca and P were insignificantly lower, when the chicks were treated with ER, BH, BP or BH + BP (T₂₋₄) compared to control treatment. The decrease level of plasma calcium and phosphorus gave indicator on improving calcium and phosphorus metabolism. This result agreed with Isaac and and Rosemary (2015) who found that addition of BH 10 ml or 20 ml/ liter water in laying hens had effect on the level of plasma calcium, but found no effect on the level of plasma phosphorus.

CONCLUSION

It is recommended to use bee honey (0.10%) with or without bee pollen (0.05%) as a growth promoter in broiler to improve the growth performance, tibia measurements and composition, as an alternative to antibiotics.

Table (3). Effect of dietary treatments on some of tibia measurements and composition of broiler chicks.

Item	Treatment					Sem.	Sign.
	Control	T1	T2	T3	T4		
Some of tibia measurements							
Wet tibia weight (g)	6.17	6.06	7.17	7.74	6.06	0.25	N. S
Dry tibia weight (g)	3.31	3.00	3.87	3.48	3.43	0.12	N. S
Tibia length (mm)	79.31	77.30	81.09	80.52	81.67	0.59	N. S
Tibia width (mm)	7.44	7.36	7.64	7.22	7.92	0.13	N. S
Tibia seeder index	0.41	0.39	0.47	0.47	0.41	0.06	N. S
Tibia breaking strength	19.98 ^b	20.26 ^b	23.51 ^{ab}	22.23 ^{ab}	28.25 ^a	5.05	*
Tibia composition %							
Ash	42.35	45.18	46.43	45.60	44.70	0.84	N. S
Calcium	16.37	14.02 ^b	17.27 ^a	16.94 ^{ab}	17.44 ^a	0.41	*
Phosphorus	7.49	8.27	8.52 ^a	8.10	7.88	0.01	N. S

a and b means in the same raw with different superscripts in the same raw are significantly ($p \leq 0.05$) different. N.S.: non-significant. control: No additives, T1: ER (Erythromycin) 0.0275%, T2: BH (Bee honey)

Table (4): Effect of dietary treatments on some of plasma calcium and phosphorus of broiler chicks.

Item	Treatments					Sem.	Sign.
	Control	T1	T2	T3	T4		
Calcium (mg/dl)	9.87	9.46	9.35	9.50	8.33	0.30	N. S
Phosphorus (mg/dl)	4.65	4.27	4.89	3.83	3.87	0.09	N. S

N.S.: non-significant. control: No additives, T1: ER (Erythromycin) 0.0275%, T2 : BH (Bee honey) 0.10%, T3: BP (Bee pollen) 0.05% and T4: (BH + BP) 0.10% + 0.05

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تأثير إضافة عسل النحل وحبوب اللقاح كبديل للمضادات الحيوية على الأداء الإنتاجي وصفات العظم وبعض مكونات بلازما الدم لبدارى التسمين

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أجريت دراسة للتعرف على تأثير استخدام عسل النحل وحبوب اللقاح أو كلاهما كبديل للمضاد الحيوي (الارثومايسين) في علائق بدارى التسمين كمنشط نمو على الأداء الإنتاجي وصفات العظم وبعض مكونات بلازما الدم. حيث تمت الدراسة علي 150 كتكوت تسمين Cobb عمر يوم حتى 35 يوم حيث قسمت الكتاكيت عشوائياً إلى 5 مجاميع وكل مجموعة تم تقسيمها إلى 3 مكررات يحتوي على 10 كتاكيت وتم معاملة هذه المجاميع كما يلي: علائق قاعدية بدون اضافات (control) و علائق قاعدية مضاف اليها المضاد الحيوي الارثومايسين و عسل النحل و حبوب اللقاح او كلاهما بمعدل % (0.0275- 0.10- 0.05 – (0.05+0.10) بالترتيب. وسجلت أهم النتائج كالتالي

- 1- وجود زيادة معنوية في وزن الجسم و الجسم المكتسب و كانت افضل النتائج في الطيور المغذاه علي عسل النحل و عسل النحل مع حبوب اللقاح
 - 2- لم تتأثر استهلاك العلف في المعاملات المختلفة و لكن تحسن معامل التحويل الغذائي رقمياً في الطيور المغذاه علي حبوب اللقاح و العسل او كلاهما
 - 3- تحسين معنوي في معادلات الاداء الانتاجي (PI) في الطيور المغذاه علي علائق مضاف اليها عسل النحل و حبوب اللقاح او كلاهما مقارنة بالكنترول
 - 4- استخدام عسل النحل و حبوب اللقاح في علائق دجاج التسمين ادي الي تحسين صفات العظم و خصوصاً قوة الكسر و حسنت بشكل معنوي مقارنة بمجموعة الكنترول و المضاد الحيوي.
 - 5- استخدام عسل النحل و حبوب اللقاح ادي الي تحسين التركيب الكيميائي لعظمة الساق و خصوصاً نسبة الكالسيوم.
- توصي هذه الدراسة بأنه يمكن استخدام عسل النحل بمفرده او مضاف اليها حبوب اللقاح كمنشط نمو بديل للمضاد الحيوي الارثومايسين لما له من اثار ايجابية علي الاداء الانتاجي و صفات عظمة الساق.