EFFECT OF BEE VENOM ON PRODUCTION PERFORMANCE AND IMMUNE RESPONSE OF BROILERS

B.T. El-Banna; A.E. Abouzeid; S.Z. El-Damrawy and T.K. El-Rayes

Animal Production Department, Faculty of Agriculture, Tanta University, Tanta, Egypt

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SUMMAY

During recent years, researchers evaluated many of eco-friendly alternatives to antibiotics such natural bee products as growth promoters in poultry production to improve the productive efficiency, modify the gut microflora, control diseases and enhancing the immune-response. The present study aimed at assessing the impacts of bee venom in drinking water on the growth performance, carcass merits, blood health, and immunity of broilers. Three hundreds and seventy five unsexed one-day old Avian chicks with an initial body weight of (45.2 ± 0.7g), were obtained from a local commercial hatchery. Chicks were kept at a private poultry farm under supervision of Animal Production Department, Faculty of Agriculture, Tanta University. Chicks were divided randomly into five equal experimental groups; each group divided into 3 replicates; each replicate has 25 birds. Control group (C) received drinking water without any supplementation (tap water). Treatment 1, 2, 3 and 4 received drinking water treated with bee venom at the level of (0.5, 1.0, 1.5 and 2.0 mg/Liter), respectively. Results showed that, birds received bee venom at the level of 2.0 mg/L drinking water had significantly (P≤0.05 and 0.01) the highest body weight. Chicks received bee venom at the level of 2.0, 1.5 and 1.0 mg/L. drinking water recorded superior (p≤0.05) weekly body weight gains than those fed 0.5 mg/L and control group. The highest (p≤0.05) amount (3008.9gm) of total feed consumption per bird recorded by the control group compared to (2908.9, 2907.0, 2916.6 or 2916.2) of those received bee venom at the levels of 2.0, 1.5, 1.0 or 0.5 mg/L, respectively. Regarding feed conversion ratio, through the whole experimental period (0 to 5 week), there were no significant differences among treated groups while, it has a significant improvement compared to birds in control group. There were significant (P≤0.05) effects for carcass, dressing, abdominal fat and relative liver, thymus, and spleen weights between broilers received drinking water supplemented with different levels of bee venom and those of the control. No significant differences (P>0.05) were observed for each IgA, IgG, and IgM. It could be concluded that the use of bee venom in drinking water of broilers up to 2mg/L. is able to improve productive performance, carcass traits and some blood biochemical parameters.

Keywords: *Bee Venom, Productive Performance, Immune Response, Broilers*

INTRODUCTION

For the sustainability of the broiler sector and its primary role in providing high-quality animal protein, different approaches have been implemented to increase the return of poultry investment. Besides, the growth promoters represent a noticeable way in altering animals' performance (Abou El-Ghar and Abd El-Karim, 2016; Fathi *et al.*, 2016; Akbari *et al*., 2016, 2018 and El-Senousey *et al.*, 2018). One of these growth promoters is antibiotic which have been added to poultry feed to improve growth performance, stabilize intestinal microflora and prevent infection by 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 reasons antibiotic growth promoters for poultry have been banned for use in the European Union and pressure from consumer groups and major poultry buyers has threatened their removal from diets in the US. Therefore, studies on alternate products that can result in promotion of growth, improved feed utilization, and maintenance of gut health are taking place (Zhang *et al*., 2005).

Hence, there is an urgent need to identify eco-friendly alternatives to reduce antibiotic use. One of the most promising methods of reducing antibiotics is to strengthen defense mechanisms of birds through prophylactic administration of natural immunostimulants (Jung *et al*., 2010). During recent years, researchers evaluated many of eco-friendly alternatives to antibiotics such as natural bee products (honey, propolis, pollen, bee bread, bee venom and royal jelly) as growth promoters in poultry production to improve the productive efficiency, modify the gut microflora, control diseases and enhancing the immune-response (Farag and El-Rayes, 2016; Rabie *et al*., 2018). Apitherapy of honey bee products traced back thousands of years and healing properties are included in many religious texts

including the Veda, Bible and Quran (Lee *et al*., 2005).

Bee Venom (BV) therapy which utilizes the application of BV to treat various diseases has been used since ancient times in traditional medicine (Tavares *et al*., 2015). It based on the fact that these crude extracts exhibit a wide variety of pharmacologically active molecules includes: "biogenic amine enzymes; Phospholipase A2, hyaluronidase, acid phosphomonoesterase, lysophospholipase, α-glucosidase, basic peptides and proteins; melittin, apamin and adolapin; Mast Cell Degranulation Peptide "MCDP" and mixture of water soluble and nitrogen containing substance" as well as non-peptide compounds, such as physiologically active amines (histamine, dopamine, and noradrenalin) (Gajski and Garaj-Vrhovac, 2013). So, the present study aimed at assessing the impacts of bee venom in drinking water on the growth performance, carcass merits, blood health, immunity, and oxidative status of broilers.

MATERIALS AND METHODS

Ethical approval:

The institutional ethical rules of Agriculture College - Tanta University (No. AY 2019-2020/Session 6/ 2020.01.13) in dealing with animals for scientific purposes were followed during the experiment period.

The present study was carried out at private poultry farm under supervision of Animal Production Department, Faculty of Agriculture, Tanta University from January to March 2021. The chemical analysis was performed in Laboratory of Animal Production Department, Faculty of Agriculture, Tanta University, to investigate the effect of different concentrations of bee venom on performance and physiological status of broilers.

Preparation of bee venom solutions:

Dried bee venom extracted from the venom sacks of the *Apis mellifera* bee was obtained from Queen of Egypt Foundation Etman Ismail Abdel Fattah Etman. The obtained venom was diluted in cold sterile water and then centrifuged under cooling (4°C) at 10000 rpm for 5 min to discard residues from the supernatant. Bee venom was lyophilized by a freeze dryer and refrigerated at 4°C for later use. Freeze-dried Apis mellifera venom was dissolved in distilled water after taking it out of the freezer and placing it at room temperature for 10 Min., this is to prepare solutions with different concentrations of bee venom in the drinking water used in the experiment included: control group received drinking water without any addition (tap water). Treatment 1, 2, 3 and 4 received drinking water treated with bee venom at the level of (0.5, 1.0, 1.5 and 2.0 mg/Liter), respectively.

Animals, housing and management:

Three hundred and seventy five unsexed one-day old Avian chicks with an initial body weight of (45.2 ± 0.7g), were obtained from a local commercial hatchery. Chicks were kept at a private poultry farm under supervision of Animal production Department, Faculty of Agriculture, Tanta University. Chicks were divided randomly into five equal experimental groups; each group divided into 3 replicates; each replicate has 25 birds. Chicks were grown in floor pens under similar managerial and hygienic conditions and subjected to 23hrs lighting along the experimental period which extended to 5 weeks of age. The house temperature was kept at about 34ºC during the first 3 days, 32ºC during next 4 days and thereafter, gradually decreased by 3ºC weekly down to 24ºC. Feed and water (contained no antimicrobial growth promoters) were available *ad labium* throughout the starter (0-14 d) and grower (15-35 d) experimental period.

Experimental diets:

The chicks were offered corn-soybean meal basal diet that was formulated to meet or exceed the nutritional requirement of growing chicks as recommended by the strain manual as shown in Table 1.

Measurements:

Performance traits:

Body weight and feed consumption were recorded weekly. Body weight gain was calculated weekly to the nearest 0.1g throughout the experimental period from 1 week until 5 weeks of age and

feed conversion ratio was calculated weekly as the number of kilograms of feed consumed to produce one kilogram weight gain during the period.

Table (1): Ingredient composition of the basal diet.

Ingredients, g/kg	Starter (0-14 days)	Grower (15-35 days)
Yellow corn	575	615
Soybean meal, 44%	320	278
Corn gluten meal, 60%	58	50
Premix[1]	3	3
Vegetable Oil	7.5	17.5
Di-calcium phosphate	15	15
Limestone	13.9	13.2
NaCl	3	3
DL- Methionine	1.85	1.8
L- Lysine. HCl	2.75	3.5
Total	1000	1000
	Nutrients Levels, %	
Crude Protein (Analyzed)	23	21
Digestible Lys	1.19	1.14
Methionine	0.59	0.54
Methionine+ Cysteine	0.94	0.89
Digestible Thr	0.77	0.70
Calcium	1.0	0.94
Available phosphorus	0.46	0.45
ME, MJ/Kg	12.43	12.85

[1]Vitamins and minerals premix / 3Kg: A (6000000, IU), D3(900000 IU), E (40000mg), K (2000mg), B1 (2000mg), B2 (4000mg), B6 (2000mg), B12 (10mg), Niacin (50000mg), Pantothenic acid (10000 mg), Biotin (50mg), Folic acid (3000mg), Choline (250000) mg, 50000 mg (Zn), 8500mg (Mn), 50000mg (Fe), 50000mg (Cu), 200 mg (I), 100mg (Se) and 100mg (Co).

Slaughter test:

At 5 weeks of age, nine birds from each group were randomly selected for slaughter test, weighed, slaughtered by slitting the jugular vein of the birds in the morning, then after complete bleeding, they were scalded and defeathered. Carcasses were eviscerated manually and weighed besides, spleen, liver, heart, and gizzard were separately weighed. All organs' weights were expressed as percentage of body weight and subjected to arcsine transformation.

Hematological examination of blood:

Haematological examinations include WBCs, RBCs, HGB, HCT, MCV, MCH, MCHC and PLT were determined by using HBVET-1 automated haematology analyzer.

Biochemical analysis of blood serum:

At the end of the trial, 3 birds from each replicate were slaughtered and blood samples were collected. Blood samples were divided into two parts; the 1st part was collected in heparinized tubes to obtain plasma while the 2nd part was collected in nonheparinized tubes to obtain serum by centrifugation for 15 minutes at 3000 rpm and stored at – 80C° for later analysis. Serum total protein was determined by using colorimetric method according to Henry *et al*. (1974), in which protein forms a colored complex with cupric ions in an alkaline medium. Serum albumin was determined by using albumin colorimetric method according to Doumas *et al*. (1971). In a buffered solution bromo cresol green form with albumin, a green colored complex whose intensity is proportional to the amount of albumin present in the sample. Serum globulin was calculated by subtracting the albumin value from the total protein value of the same sample (Coles, 1974). Serum transaminases were determined using commercial kits of RANDOX Co. SGPT according to Reitman and Frankel (1957). Using commercial kits of RANDOX Co., serum total lipids were determined by colorimetric method according to the

methods of Zollner and Kirsch (1962). Serum triglycerides were determined by triglycerides kits according to the method described by Sidney and Barnard, (1973). Serum total cholesterol, high density lipoprotein (HDL) and low-density lipoprotein (LDL) were determined by commercial detection kits according to Allina *et al*. (1974).

Immune-response:

Serum immunoglobulin A (IgA), immunoglobulin G (IgG) and immunoglobulin M (IgM) concentrations were determined appropriately with diluted samples by a sandwich ELISA using microtiter plats and specific IgA, IgG and IgM ELISA quantitation kits (Bethyl Laboratories Inc., Montgomery, TX) according to Piquer *et al.* (1991).

Statistical analysis:

Data were statistically analyzed by one-way ANOVA, using the general linear model procedure SAS (2000). Tests of significance for differences among treatments were done according to Duncan (1955). The statistical model was used for the analysis of variance to estimate the effect of bee venom treatment on broiler performance and physiological status traits.

RESULTS AND DISCUSSION

Performance traits:

As showed in Table (2), initial body weights were not differing among treatments groups. During the whole experimental period, birds received bee venom at the level of 2.0 mg/L drinking water had significantly (P≤0.05 and 0.01) the highest body weight followed by those received 1.5 mg/L drinking water followed by those received 1.0 mg/L drinking water and then those birds received 0.5 mg/L drinking water compared to the control. At the same time, no significant differences (P>0.05) were observed between groups treated by 1.0, 1.5 or 2.0 mg/L drinking water. Generally, at the end of the experimental periods (five week of age) body weights of groups received bee venom at the level of 2.0 and 1.5 mg/L of drinking water significantly (P≤ 0.01) increased by 8.03 and 7.84%, respectively. Meanwhile, body weight of those received 1.0 and 0.5 mg/L of drinking water increased by (7.91% and 4.17 %), compared to that of the control.

Table (3) showed the effect of bee venom supplementation in drinking water on performance traits of broiler chicks. Chicks received bee venom at the level of 2.0, 1.5 and 1.0 mg/L drinking water recorded weekly superior (p≤0.05) body weight gain than those fed 0.5 mg/L and control group. At the end of experimental period, results showed that highest total body weight gain values (2031.1, 2027.6 and 2027.8g) yielded by birds received 2.0, 1.5 and 1.0 mg/L followed by 1955.5g of those received 0.5mg/L compared to control group (1876.3g), respectively.

Table (2): Effect of bee venom supplementation in drinking water on live body weight (BW) of broiler chicks during experimental period.

Treatments	Initial BW (g)	BW at 21 day (g)	Final BW at 35 day (g)
Control (T1)	41.2	904.5^{c}	1917.5^{c}
(0.5mg/L.) (T2)	41.9	926.1^{b}	1997.4^{b}
(1.0mg/L.) (T3)	41.4	955.8^{a}	2069.2^{a}
(1.5mg/L.) (T4)	40.2	952.7^{a}	2067.8^{a}
(2.0mg/L.) (T5)	40.2	953.3^{a}	2071.5^{a}
SEM	±0.43	±11.78	±18.22
Significance	NS	*	**

*a, b, c Means within a row with no common superscripts differ significantly. NS= not significant, * P< 0.05, ** P< 01.*

The amount of weekly feed consumption was significantly (p≤0.05) decreased for groups treated with bee venom at the levels of 2.0, 1.5, 1.0 or 0.5 mg/L drinking water compared to the control group, respectively. Generally, at the end of experiment of period, the highest (p≤0.05) amount (3008.9g) of total feed consumption per bird recorded by the control group compared to (2908.9, 2907.0 , 2919.6 or 2916.2 g) of those received bee venom at the levels of 2.0, 1.5, 1.0 or 0.5 mg/L, respectively.

Regarding feed conversion ratio, through the whole experimental period (0 to 5 week), there were no significant differences among groups treated with 2.0, 1.5, and 1.0 mg of bee venom /L drinking water. While, all the treated groups has a significant improvement compared to birds in control group. The improvement of fed conversion ratio ranged between 12.6% of birds received 2.0 mg bee venom/L drinking water and 8.1% of those received 0.5 mg/L compared to the control group.

Table (3): Effect of bee venom supplementation in drinking water on weekly weight gain (WG), feed consumption (FC) and feed conversion ratio (FCR) of broiler chicks during experimental period.

Treatments	Starter Period From0–21 days of age			Grower Period From 22– 35 days of age			Total Period From 0 – 35 days of age		
	WG	FC	FCR	WG	FC	FCR	WG	FC	FCR
Control (T1)	863.3^{b}	.131.6	1.31^{a}	1013.0^{c}	1877.3^{a}	1.85^{a}	1876.3^{c}	3008.9^{a}	1.61^{a}
(0.5mg/L.) (T2)	884.2^{b}	.097.7	1.24^{b}	1071.3^{b}	1818.5^{b}	1.69^{b}	1955.5^{b}	2916.2^{b}	1.49^{b}
(1.0mg/L.) (T3)	914.4^{a}	.098.3	1.20^{b}	1113.4^{a}	1821.3^{b}	1.63^{c}	2027.8^{a}	2916.6^{b}	1.44^{c}
(1.5mg/L.) (T4)	912.5^{a}	.093.6	1.19^{b}	1115.1^{a}	1813.4^{b}	1.62^{c}	2027.6^{a}	2907.0^{b}	1.43^{c}
(2.0mg/L.) (T5)	913.1^{a}	.093.8	1.19^{b}	1118.2^{a}	1815.1^{b}	1.62^{c}	2031.3^{a}	2908.9^{b}	1.43^{c}
SEM	±34.6	±4.85	±0.02	±34.18	±34.25	±0.16	2.94±	±4.65	±0.02
Significance	*	NS	*	*	*	*	*	**	*

*a, b, c Means within a row with no common superscripts differ significantly. NS= not significant, * P< 0.05, ** P< 0.01,*

The present data are in harmony with (Jung *et al*., 2013) who demonstrated that administering honeybee venom (HBV) by spray had a beneficial effect on body weight gain in broiler chicks. On the other direction, Rabie *et al*. (2018) reported that there were no significant differences in body weight and weight gain between control group and those received bee venom. The previous results are in line with many authors (Rabie *et al*., 2018; Han *et al*., 2010). They observed that, bee venom and other honeybee products had significantly lower average daily feed intake during the whole experimental interval and significantly improved overall feed conversion ratio compared to the control. On contrary, Elkomy *et al*. (2021) cited that there was no effect due to injection of rabbit does with BV on daily feed intake and the BV group consumed approximately the same amount of feed.

Carcass characteristics:

No significant (P>0.05) differences were observed between all treatments for the relatives weight of gizzard, heart, and bursa. On the other hand, there were significant (P≤0.05) effects for carcass, dressing, abdominal fat and relative liver, thymus, and spleen weights between broilers received drinking water supplemented with different levels of bee venom. Whereas a significant increasing in the relative weights of carcass, dressing, thymus, spleen, and liver is observed with an increase in the level of bee venom in the drinking water of broiler chickens. At the same time, relative weight of abdominal fat was significantly decreased by increasing bee venom level from 0.5 up to 2.0 mg/L of drinking water (Table 4).

Along with our data, Kim *et al*. (2018) showed that, relative breast meat yields were increased quadratically at 21 d and linearly at 35 d of age with supplementation levels of BV. Also, dietary BV increased (linear and quadratic, P<0.05) lightness value for meat at 21 d, decreased (linear, P<0.05) ileal villus height and narrowed (quadratic, P<0.05) width. At the same time, broilers fed diet supplemented with high level of BV had lowered relative weight of spleen (linear and quadratic, P<0.05), bursa of Fabricius (quadratic, P<0.05), and liver (linear and quadratic, P<0.05) at 21 d of age. On the other hand, relative abdominal fat weight was not influenced by bee venom supplementation at all experimental period.

Table (4): Effect of bee venom supplementation in drinking water on carcass characteristics and relative lymphoid organ weight of broiler chicks at 5 weeks of age.

Treatments	Carcass characteristics								
	Carcass (%)	Dressing (%)	Abdominal fat (%)	Liver (%)	Gizzard (%)	Heart (%)	Thymus (%)	Bursa (%)	Spleen (%)
Control	66.41^{b}	73.39^{b}	2.73 ^{a}	2.03 ^{b}	1.83	0.39	0.25^{c}	0.83	0.14^{b}
T1 (0.5mg/L.)	68.31^{a}	75.15^{ab}	2.29 ^{b}	2.31 ^{a}	1.78	0.46	0.33^{b}	0.85	0.17^{a}
T2 (1.0mg/L.)	68.45^{a}	75.23^{ab}	2.12 ^{c}	2.32 ^{a}	1.90	0.44	0.33^{b}	0.84	0.17^{a}
T3 (1.5mg/L.)	70.75^{a}	77.53^{a}	2.15 ^{c}	2.42^{a}	1.79	0.42	0.41^{a}	0.86	0.18^{a}
T4 (2.0mg/L.)	71.33^{a}	78.03^{a}	2.08 ^{c}	2.38^{a}	1.81	0.43	0.42^{a}	0.85	0.17^{a}
SEM	±1.63	±1.89	±0.05	± 0.11	±0.07	±0.05	±0.03	±0.02	±0.01
Significance	**	*	**	*	NS	NS	*	NS	*

*a, b, c Means within a row with no common superscripts differ significantly. NS= not significant, * P< 0.05, ** P<0.01.*

Blood constituents:

There were no significant (p>0.05) differences (Table 5) between all treatments for the concentration of total protein, albumin and globulin. While, the activity of GPT and GOT enzymes were significantly (P≤0.01) decreased by increasing supplementation level of bee venom from 0.5 up to 2mg/L drinking water. Similarly, the concentration of triglycerides was significantly (P≤0.01) decreased by increasing supplementation level of bee venom from 0.5 up to 2mg/L drinking water. At the same time, each of total lipids, total cholesterols, and LDL-cholesterol were significantly (P≤0.05) decreased by increasing supplementation level of bee venom from 0.5 up to 2mg/L drinking water. On the other hand, the concentration of HDL- cholesterol was significantly (P≤0.05) increased by increasing supplementation level of bee venom from 0.5 up to 2mg/L drinking water.

The previous data are agree with Kim *et al*. (2018) who showed that, except triglycerides and non-esterified fatty acids, increasing dietary bee venom in the diet had no effect on most blood markers. On the other hand, Elkomy *et al*. (2021) showed that, by injecting tested does with BV, plasma total protein, albumin, and globulin concentrations were significantly (p≤0.05) higher compared to control does . Although, plasma total lipids, cholesterol, AST, ALT, and urea levels were significantly (p≤0.05) lower, indicating that injecting does with BV was a favorable signal.

Table (5): Effect of bee venom supplementation in drinking water on some blood constituents of broiler chicks at 5 weeks of age.

Treatments	Blood constituents									
	Total protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	SGPT (U/L)	SGOT (U/L)	Total lipids (mg/dl)	Triglycerides (mg/dl)	Cholesterol (mg/dl)	HDL (mg/dl)	LDL (mg/dl)
Control	4.32	1.38	2.19	29.21^{a}	213.55^{a}	250.00^{a}	100.78^{a}	109.31^{a}	16.55^{c}	61.73^{a}
T1 (0.5mg/L.)	3.87	1.56	2.01	27.06^{a}	189.00^{ab}	242.31^{a}	65.55^{b}	101.55^{a}	18.60^{bc}	61.71^{a}
T2 (1.0mg/L.)	3.80	1.61	1.96	26.30^{a}	184.78^{b}	235.28^{a}	55.86^{b}	90.94^{ab}	22.05^{ab}	57.20^{ab}
T3 (1.5mg/L.)	3.91	1.39	2.13	20.73^{b}	146.76^{c}	231.25^{a}	55.71^{b}	85.20^{ab}	21.00^{ab}	50.03^{ab}
T4 (2.0mg/L.)	3.91	1.58	1.98	16.36^{b}	104.33^{d}	173.30^{b}	33.51^{c}	72.96^{b}	24.33^{a}	46.51^{b}
SEM	±0.06	±0.04	±0.09	±1.14	±5.05	±9.72	±4.14	±3.08	±0.89	±3.03
Significance	NS	NS	NS	**	**	**	**	*	*	*

*a, b, c Means within a row with no common superscripts differ significantly. NS= not significant, * P< 0.05, ** P<0.01.*

Blood hematology:

No significant differences (P>0.05) were observed for RBCs, HGB, MCH, MCHC and PLT. On the other direction, both of WBCs and HTC were significantly increased by increasing supplementation level of bee venom from 0.5 up to 2mg/L drinking water (Table 6). Whereas broiler received bee venom at the level of 2 mg/L drinking water had significantly (P≤0.01) the highest count of WBCs followed by those treated with 1.5 and then those received 1 mg/L by 30.49, 30.36, and 18.36% respectively, compared to control group. Furthermore, broiler received bee venom at the level

of 2 mg/L drinking water had significantly (P≤0.05) the highest value of HTC followed by those treated with 1.5 and then those received 1 mg/L by 9.04, 5.50, and 4.19% respectively, compared to control group.

The percentage of MCV was significantly decreased by increasing supplementation level of bee venom from 0.5 up to 2mg/L drinking water. Whereas broiler received bee venom at the level of 2 mg/L drinking water had significantly (P≤0.05) the lowest percentage of MCV followed by those treated with 1.5 and then those received 1 mg/L by 4.27, 3.65, and 3.63% respectively, compared to control group.

Our results of blood hematology are compatible with those observed by (Bolarinwa *et al*., 2013) they found that, there were no significant differences (P>0.05) in the hematological parameters examined being RBCs, PCV and platelets levels between the control and the tested treatments which received bee venom at different levels. Furthermore, Elkomy *et al*. (2021) cited that, rabbit does treated with BV for 1 week before mating resulted in significant ($p \leq 0.05$) increase in RBC and Hgb compared to the control group. On the other hand, there are insignificant effects of BV treatment on PCV, MCV, MCH and MCHC. In addition, significant ($p \leq 0.05$) increase in WBCs values compared to the control group was observed. Also, data revealed that WBCs differentiation was not affected by BV treatment.

Table (6): Effect of bee venom supplementation in drinking water on blood hematology of broiler chicks at 5 weeks of age

Treatments	Blood hematology							
	RBCs (10^6/mm^3)	WBCs (10^3/mm^3)	HGB (g/dl)	HTC %	MCV (µm^3)	MCH (pg)	MCHC %	PLT (10^3/mm^3)
Control	2.43	130.66^{c}	14.90	30.50^{b}	131.90^{a}	61.18	47.83	7.16
T1 (0.5mg/L.)	2.50	141.00^{bc}	14.91	31.71^{ab}	129.70^{ab}	59.80	47.00	7.50
T2 (1.0mg/L.)	2.53	154.66^{ab}	15.50	31.78^{ab}	127.10^{ab}	61.31	47.25	7.83
T3 (1.5mg/L.)	2.41	170.33^{a}	14.53	32.18^{ab}	127.08^{b}	59.90	47.25	7.16
T4 (2.0mg/L.)	2.49	170.50^{a}	15.05	33.26^{a}	126.26^{b}	60.38	47.50	5.66
SEM	±0.05	±5.94	±0.35	±0.66	±1.07	±0.97	±1.50	±0.87
Significance	NS	**	NS	*	*	NS	NS	NS

*a,b,c Means within a row with no common superscripts differ significantly. NS= not significant, * P< 0.05, ** P<0.01.*

Immune-response:

Data presented in Table (7) show that no significant differences (P>0.05) were observed for each IgA, IgG, and IgM.

Table (7): Effect of bee venom supplementation in drinking water on immunoglobulins of broiler chicks at 5 weeks of age.

Treatments	Immunoglobulins		
	IgA (mg/dl)	IgG (mg/dl)	IgM (mg/dl)
Control	1.66	1.00	1.33
T1 (0.5mg/L.)	1.00	1.00	1.66
T2 (1.0mg/L.)	1.66	1.00	1.33
T3 (1.5mg/L.)	2.00	1.00	1.33
T4 (2.0mg/L.)	1.66	1.00	2.00
SEM	±0.33	±0.01	±0.45
Significance	NS	NS	NS

NS= not significant

Our results are not compatible with those observed by (Kim et al., 2018) who reported that, dietary BV inclusion linearly increased the concentration of secretory immunoglobulin A (sIgA) on ileal mucosa at 21 d and decreased (quadratic, $P < 0.05$) nitric oxide contents in serum samples at 21d and 35 d. Our results are not compatible with those observed by Kim *et al.* (2018) who reported that,

Dietary BV inclusion lowered (P<0.05) the concentration of nitric oxide in blood samples at 21d and 35d while linearly increasing the concentration of secretory immunoglobulin A (sIgA) on ileal mucosa at 21d. Additionally, Rabie *et al*. (2018) they found that, in comparison to the control treatment, the humeral immune response against sheep red blood cells was raised in propolis (400 mg/kg food) or bee-venom (2 mg/L water) treatments. In addition, as compared to the control treatment, the bee-venom (2 mg/L water) treatment had considerably larger relative spleen and bursa weights.

CONCLUSION

The use of bee venom in drinking water of broiler up to 2mg/L. is able to improve productive performance, carcass traits and some blood biochemical parameters.

FINANCIAL SUPPORT AND SPONSORSHIP: NIL

CONFLICT OF INTEREST: NIL

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تأثير سم النحل على أداء الإنتاج والاستجابة المناعية لدجاج التسمين

باسم طارق البنا ، عادل السيد ابوزيد ، سعد زغلول الدمراوي ، طلعت خضر الريس

قسم الانتاج الحيواني - كلية الزراعة – جامعة طنطا – جمهورية مصر العربية

خلال السنوات الأخيرة ، قام الباحثون بتقييم العديد من بدائل المضادات الحيوية الصديقة للبيئة كمحفزات للنمو والمناعة في قطعان الدواجن والتي من أهمها منتجات النحل الطبيعية. أجريت هذه التجربة في مزرعة دواجن خاصة تحت إشراف قسم الإنتاج الحيواني بكلية الزراعة جامعة طنطا. وهدفت الدراسة الحالية إلى تقييم تأثير سم النحل كأحد منتجات النحل الطبيعية في مياه الشرب على الأداء الانتاجي ، خصائص الذبيحة ، حالة الدم البيوكيميائية والهيماتولوجية ، الاستجابة المناعية ، وحالة مضادات الأكسدة لدجاج التسمين. استخدم لهذه الدراسة عدد ثلاثمائة وخمسة وسبعين كتكوت تسمين عمر يوم واحد غير مجنسة متوسط وزنها (45.2 ± 0.7 جم). تم تقسيم الكتاكيت عشوائيا إلى خمس مجموعات تجريبية متساوية ، كل مجموعة قسمت داخليا إلى 3 مكررات ؛ بكل مكررة عدد 25 طائر. تلقت المجموعة الضابطة مياه الشرب بدون أي اضافات (مياه الصنبور) ، المعاملات 1 و 2 و 3 و 4 تمت معالجتها بسم النحل بمستويات (0.5 ، 1.0 ، 1.5 ، 2.0 مجم / لتر) على التوالي. أظهرت النتائج حدوث زيادة معنوية في متوسط وزن الجسم وكذا معدل الزيادة الاسبوعية في وزن الجسم للطيور التي تلقت سم النحل وخاصة عند مستوى 2.0 ملجم / لتر من ماء الشرب والتي كان لها أعلى متوسط وزن جسم وكذا متوسط زيادة اسبوعية في وزن الجسم. حدث انخفاض معنوي في متوسط استهلاك العلف للمعاملات التي تناولت المستويات المختلفة من سم النحل مقارنة بالمجموعة الكنترول. تشير النتائج ايضا الي حدوث تحسن معنوي في الكفاءة التحويلية للمجموعات التي تناولت ماء الشرب المعزز بسم النحل تحت المستويات المختلفة مقارنة بالمجموعة الكنترول وان لم يكن هناك فروق معنوية بين المعاملات التي تناولت سم النحل. بالنسبة لخصائص الذبيحة تبين النتائج وجود اختلافات معنوية ايجابية في الوزن النسبي لكلا من الذبيحة ونسبة التصافي ، دهن البطن ، الكبد ، الغدة التيموسية ، الطحال بين الطيور التي تناولت سم النحل وتلك الموجودة في المجموعة الكنترول. علاوة علي ذلك لم يلاحظ أي فروق ذات دلالة إحصائية بمستويات كل من IgA، IgG ، و IgM.

وخلصنا من هذه الدراسة إلى أن استخدام سم النحل في مياه شرب كتاكيت التسمين بنسبة تصل إلى 2 ملجم / لتر قادرة على تحسين الأداء الإنتاجي ، وصفات الذبيحة وبعض مقاييس الدم البيوكيميائية.

الكلمات المفتاحية: *سم النحل ، الاداء الانتاجي ، الاستجابة المناعية ، دجاج التسمين*