Egyptian Poultry Science Journal

http://www.epsaegypt.com

ISSN: 1110-5623 (Print) – 2090-0570 (On line)

EFFECT OF SUPPLEMENTING DIET WITH PROPOLIS ON BANDARAH CHICKS' PERFORMANCE

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Received:24/01/2017 Accepted:22/02/2017

ABSTRACT: The present experiment was carried out for studying the effect of supplementing diet with propolis on Bandarah chicks' performance. Atotal of 360 unsexed one-day old chicks of Bandarah strain were randomly distributed into four treatments groups of three replicates (each contained 30 chicks). Chicks were raised in battery brooder throughout the experimental period which ended at 12 wks of age. Group one was fed a basal diet and considered as control group. The other three groups 2, 3 and 4 were fed a basal diet supplemented with 150, 300 and 450 mg propolis/kg diet, respectively. The results showed that body weight (BW) and body weight gain (BWG) were significantly ($p<0.01$) increased with increasing of propolis level. Average of feed consumption was not affected by adding propolis during the first periods of experiment (0-4), (4-8) and the overall mean (0-12) wks. However, during (8-12) wks of age feed consumption was significantly decreased with increasing of propolis levels. The best feed conversion ratio was recorded for the group supplied with the highest level of propolis (450 mg/kg diet). Carcass relative weight and the lymphoid organs weights (spleen, bursa and thymus) were significantly improved ($p<0.01$) by increasing propolis supplementation. Chicks fed diet supplemented with propolis were significantly increased hematological parameters (Hb, PCV, RBCs and WBCs). Likewise, plasma protein, albumin, globulin, IgG, IgM and antioxidants enzymes (TAC; SOD) were significantly increased in treated groups compared with control group. Significant decrease was observed in plasma lipids, cholesterol, triglyceride, lipid peroxidation (MDA) and transaminase enzymes (AST; ALT) resulted from adding propolis to chicks' ration. Moreover, the intestinal total aerobic and anaerobic micro-flora counts and the count of total coliform were decreased with increase of propolis level. Generally propolis supplementation at any levels to chick's diet improved net revenue and economical efficiency. In conclusion, supplemental propolis to chicks' diet had a positive effect on growth performance, physiological, immunological and anti-oxidative status. Furthermore, addition 450 mg propolis/kg diet could be recommended for improving chick's health and economic efficiency.

Key words: Propolis, Bandarah chicks, blood components, immunity, antioxidant.

INTRODUCTION

Bee propolis is a complex resinous hive product and mixture of wax, sugars and plant exudates collected by bee from certain plant sources. Propolis are used by worker bees to line the inside of nest cavities and all brood combs, repair combs, seal small cracks in the hive, reduce the size of hive entrances, seal of inside the hive any dead animals or insects which are too large to be carried out. More than 300 constituents have been identified in different propolis samples (Turkez et al., 2010). In general, it is composed of 50% resin and vegetable balsam, 30% wax, 10% essential and aromatic oils, 5% pollen and 5% various other substances, including organic debris (Silva et al., 2007). Propolis is rich in biochemical constituents, including mostly a mixture of polyphenols, flavonoids (major ingredient), phenolic acid and their esters, caffiec acid and their esters, phenolic aldehydes and ketones, respectively (Khalil, 2006). The chemical composition of propolis contributes to its antioxidant, antimicrobial, anti-inflammatory, antiviral, immunomodulatory, and other biological properties (Lofty, 2006).

Propolis supplementation is used in poultry diets (Tatli Seven, 2008). However, Mathivanan et al. (2013) reported that propolis has a beneficial influence on daily gains, feed intake and conversion in different animal species, including poultry. In fact, studies have shown that propolis is able to cause immunomodulatory effects in animals, influencing the activation of macrophages, antibody synthesis and the weight of lymphoid organs (Cetin et al., 2010; Fischer et al., 2010). Many studies recorded the beneficial effect of propolis on growth performance and immune response in poultry (Shalmany and Shivazad, 2006; Tatli Seven et al., 2008; Babaei et al., 2016).

The antioxidant activity of propolis is mainly attributed to its flavonoid content, such as quercetin, flavones, isoflavones, anthocyanins, catechins and isocatechins (Alves and Kubota, 2013) that are capable of scavenging free radicals and thereby protection against lipid peroxidation.

Additionally, propolis has important pharmacological properties and it can be used for a wide range of purposes. According to Velikova et al. 2000, propolis has shown tendency to be effective against a variety of bacteria, especially against gram-positive and some gram-negative bacteria. Thus, propolis is an alternative to the use of dietary antibiotics (Itavo et al., 2011).

The aim of the present study was to investigate the effect of propolis inclusion to the feed mixture on performance, carcass traits, some physiological, immunological and anti- oxidative status of Bandarah chicks.

MATERIALS AND METHODS

The present experiment was carried out at El-Sabahia Poultry Research Station, Animal Production Research Institute, Agricultural Research Center, Egypt. Three hundred and sixty unsexed one-day old chicks of Bandarah strain were wing-banded, weighed and randomly distributed into four treatments groups of three replicates (each contained 30 chicks). Chicks were raised in battery brooder under similar managemental and hygienic conditions. Feed and water were supplied *ad libitum* throughout the experimental period which ended at 12 wks of age. The basal diet (control) was formulated to meet nutrient requirements of chicks. The composition of the basal diet is given in Table (1). Chicks in group 1 were fed a basal diet and considered as control group, the other three group 2, 3 and 4 were fed a basal diet supplemented with 150, 300 and 450 mg propolis/kg feed respectively .

Initial chicks body weight (BW) was recorded and biweekly throughout the

experimental periods. Also, feed consumption (FI) was recorded biweekly, then body weight gain (BWG) and feed conversion ratio (FCR, g feed/g gain) were calculated for the same periods.

At the end of the experimental period (12 wks of age), five birds from each treatment were selected randomly, weighed and slaughtered for carcass evaluation. Carcass was eviscerated and head and shank were removed, abdominal fat, liver, gizzard, heart, spleen, bursa and thymus were dissected from the viscera and weighed. Each organ was expressed as a percentage of live body weight. Intestinal aerobic and anaerobic microflora counts were determined. Aerobic plate count (APC), total coliform count and total anaerobic count were carried out according to American Public Health Association (A.P.H.A, 1985). Blood samples were collected from slaughtered birds to determine biochemical constituents of blood using commercial kits.

A portion of the fresh blood was used to measure the white blood cells count (WBCs), red blood cells count (RBCs), hemoglobin (Hb) and packed cell volume (PCV). Plasma was obtained from the blood samples by centrifugation for 15 min. at 3000 rpm and was stored at -20 C until the time of analysis. Plasma total protein, albumin, total lipids, cholesterol, triglycerides, alanine aminotransferase (ALT), and asparatate aminotransferase (AST) were determined by spectrophotometrically using available commercial Kits. Total antioxidant capacity (TAC), Malondialdehyde (MDA) and Superoxide dismutase (SOD) activities were calorimetrically determined using commercial Kits. Plasma immunoglobulin, IgG and IgM were determined using the method of Leslie and Frank (1989).

Feed economic efficiency and relative economic (EE and REE) of the experimental diets was calculated according to input-output analysis at the end of the experiment (Hassan et al., 1996).

Data were statistically analyzed according to SAS program (SAS, 2004) using GLM Procedure. All the data were subjected to one way analysis of variance model. Mean differences were tested by Duncan's multiple range (Duncan, 1955).

RESULTS AND DISCUSSION

Growth performance

Data in Table 2 summarized the differences in live body weight (BW) and body weight gain (BWG) among chicks fed diet with propolis. The results revealed that no significant differences in the initial live body weight of chicks at one day old. Body weight (BW) and body weight gain (BWG) were significantly ($p<0.01$) increased with increase of propolis level during the experimental periods. Whereas, BW increased by 6.85, 11.48 and 19.44 % respectively above the control value at 12 wks. The same trend was observed for BWG at one day – 12 wks of age to reach 7.08, 11.89 and 20.09 % over the control value. Our findings are supported by Hascik et al. (2015), Zafarnejad et al. (2016) and Babaei et al. (2016) who found that supplemented diet with propolis resulted in significant increase in live body weight. Additionally, El-Neney et al. (2016) indicated that used propolis at 100, 200 and300 mg/kg diet for chicks significantly increased BW and BWG. In contrast, Mahmoud et al. (2013) and Kleczek et al. (2014) observed that broiler BW and BWG were not affected by propolis addition.

The improvement in BW and BWG in the current study may be due to the presence of micronutrients, high content of flavonoids and phenolic acids in propolis which improve a beneficial microbial in the gut and reflected on positive effects on health and metabolism (Viuda-Mattos et al., 2008).

Table 3 shows that added different levels of propolis to the ration did not cause any

significant differences in the feed consumption up to 8 wks of age. While, feed consumption significantly decreased with increasing propolis levels during 8 to 12 wks of age. Generally, total feed consumption from 0 – 12wks was not affected by propolis supplementation. This result is consistent with Ozkok et al. (2013) who noticed that inclusion propolis in layer ration at 100, 200 and 400 mg/kg were not affected on feed consumption. Also, Canogullari et al. (2009) and Abdel-Rahman and Mosaad (2013) reported that dietary propolis of birds had no significant effect on feed consumption. On the other hand, Attia et al. (2015) and El-Neney et al. (2016) showed that supplemental propolis in chicks ration caused reduction in feed consumption compared with control value.

Concerning the feed conversion ratio (FCR), the results showed that FCR significantly improved for chicks fed diet containing propolis. The best FCR was recorded for 450 mg propolis/kg diet. Whereas, the average of FCR was significantly ($p<0.01$) improved by 8.18, 16.09 and 21.37% above the control value for chicks fed diet supplemented with propolis at levels of 150, 300 and 450 mg/kg, respectively for the all experimental period (0-12) wks of age. This result is in harmony with finding of Galal et al. (2008), Abdel-Kareem and El-Sheikh (2015) who mentioned that used propolis at 100 to 1000 mg/kg resulted in significant improved FCR for birds. The same finding was observes by Babaei et al. (2016). The positive effect of propolis on FCR in the current study may be attributed to the antimicrobial properties of propolis which preventing subclinical infections (Brander et al., 1982).

Carcass traits

Results in Table 4 indicated that there was a significant increase ($p<0.01$) in carcass relative weight for Bandarah chicks by 3.74, 7.90 and 10.61 % over the control value for the groups supplied with 150, 300 and 450 mg propolis/kg diet, respectively. This increase compatible with the increase in BW for chicks due to positive effect of propolis on growth rate. Similar results were confirmed by Attia et al. (2014) and Hascik et al. (2015) who reported that carcass weight was increased by adding propolis in broiler ration. However, supplied chicks' diets with propolis had no significant effects on gizzard, heart and liver percentages.

The relative weights of lymphoid organs (spleen, bursa and thymus) were significantly increased ($p<0.01$) by increasing propolis supplementation to chicks' diets (Table 4). Whereas, spleen weight increased by 12.93, 27.21 and 30.61 % compare with control value. The same trend was shown in bursa and thymus weights. However, both 300 and 450 mg propolis had the same potent effect for increasing lymphoid organs weight. This increase in the lymphoid organs weight of chicks may be due to the action of propolis on cellular element of these organs. The relative weight of lymphoid organs is often used to predict the immune status of an animal (Abdel-Fattah et al., 2008). According to Fan et al. (2013) propolis is able to enhance lymphocyte proliferation, and this can reflect in the lymphoid organs weight, impacting on immune function and disease resistance ability. These findings are confirmed with Hegazi et al. (2012) and Zafarnejad et al. (2016) who reported an increase in the weight of lymphoid organs of the chicks fed diet with propolis.

Blood parameters

Table 5 refers to the effect of propolis supplementation on hematological values for Bandarah chicks. There was a significant increase ($p<0.01$) in red blood cells (RBCs), hemoglobin (Hb) and packed cell volume (PCV) with increase of propolis supplementation in chicks rations compared to the control group. The positive effect of propolis on previous parameters may be due to the direct effect

on haemopoietic tissue and improve digestive utilization of iron which regeneration efficiency of hemoglobin (Haro et al., 2000). Our results agree with the findings of Attia et al. (2014) who concluded that adding propolis in broiler ration continuously or intermittently at level of 300 mg/kg resulted in an increase of RBCs and Hb. The same results obtained by Omar et al. (2014) for Sasso chickens and Shreif and El-Saadany (2016) for laying hens.

With regard to the white blood cells (WBCs), the results showed that a significant ($p<0.01$) improved in WBCs count when chicks fed diet provided by propolis. Whereas, WBCs increased by 13.73, 17.39 and 25.86 % compared with the control value, respectively. These results are confirmed upon examination of propolis on laying hens (El Neny et al., 2014 and Shreif and El-Saadany 2016). According to Taheri et al. (2005), Propolis have antioxidant and anti-inflammatory effects which related to the inhibition of prostaglandin synthesis as antiimmune substance and resulting better humoral response.

Supplementation chicks' diets with propolis significantly ($p<0.01$) increased plasma IgG and IgM values and this increase was in a level dependent manner (Figure 1). These results are in agreement with Cetin et al. (2010) and Freitas et al. (2011) who noticed that treatment with propolis caused increase in IgG and IgM concentration compared with control group. The improvement in immunological status may be related to propolis containing flavonoids components which elevate cytokines. This cytokines stimulate B lymphocytes activities which would be able to produce immunoglobulin (Freitas et al., 2011).

Data of Table 6 indicate that there were significant ($p<0.01$) increase in plasma total protein, albumin and globulin when chicks fed diet containing propolis and this increase was in a level-dependent manner. The beneficial effect of propolis on protein fractions may be due to the stimulating effect on liver exhibiting an anabolic action favoring protein synthesis and its preserving effect to the body protein from degeneration. The improvement on globulin concentration and protein fractions observed in the current study may be due to chicks liver will be able to synthesize enough globulins for immunologic action which preserving the body protein from degeneration (Khalil, 2006). These results are in harmony with that reported by Abdel-Kareem and El-Sheikh (2015) who mentioned that propolis supplementation (250, 500 and 1000 mg/kg) in layer ration increased total plasma protein, albumin and globulin.

Data of Table 6 show that lipids profile (total plasma lipids, cholesterol and triglyceride) was significantly ($p<0.01$) improved by adding propolis to chicks diets. The lowest total lipids, cholesterol and triglyceride values were recorded for chicks fed diet containing 450 mg propolis/kg. The hypocholesterolemic effect of propolis may be due to the anti-oxidizing properties of propolis. In the same respect, Eraslan et al. (2007) reported that propolis contains some flavonoids, steroids, phenolic acids and their esters.

These compounds may prevent of lipid peroxidation which is regulate cholesterol synthesis. Also, Nader et al. (2010) indicated that propolis could be prevented the occurrence of atherosclerotic lesions in arteries.Our results were confirmed upon examination of propolis on broilers (Attia et al., 2014), laying hens (Shreif and El-Saadany 2016) and Japanese quail (Zeweil et al., 2016 a,b).

Results of transaminases activities (AST and ALT) are illustrated in Table 6. There were a significant ($p<0.01$) decrease in serum AST and ALT activity by increasing of propolis in chicks ration. The same result was 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. Similarly, Abdel-Kareem and El-Sheikh (2015) found reduction in the liver enzymes (AST and ALT) when laying hens fed diet provided by propolis at 250, 500 and 1000 mg/kg. The present results concerning the decreasing of the serum transaminases activities may be attributed to higher biological activity and nutritive values contents in propolis, which could prevent lipid peroxidation.

As shown in Figure 2, a significant ($p<0.01$) increase in plasma total antioxidant capacity (TAC) and Superoxide dismutase (SOD) activities with increase of propolis levels. When chicks fed diet supplemented with propolis resulted from a significant decrease in Malondialdehyde (MDA) level compared with control group. Our findings are supported by Mahmoud et al. (2015) who indicated that providing broiler ration with propolis at 250, 500 and 750 mg/kg resulted in significant increase in TAC and decrease in MDA, which may be due to its high flavonoid content. Tatli Seven et al. (2009) suggested that propolis at the supplemented dose of 3mg/kg diet might be considered in the prevention of oxidative stress in broiler exposed to heat stress. The improvement of antioxidant status for chicks in the current study related to the antioxidant activity of propolis which may due to the ability of phenolic compounds to donate hydrogen ions that can attack the free radicals to prevent the oxidation reactions in the cell (El-Sohaimy et al., 2014).

Microbiological study

The results of the intestinal microbial counts for chicks are presented in Table 7. Supplemental propolis to chicks' diet caused reduction in the intestinal total aerobic and coliform counts compared with control group. Also, total anaerobic count was negative and undetected in the treated propolis groups. The beneficial effect of propolis on intestinal microbial count in the present study may be due to the presence of phenols and flavonoids components in propolis which could be attributed to antimicrobial activity (Tatli Seven et al., 2009). Furthermore, the mode of action of propolis may be due to a strong effect of antibacterial action and the presence of micronutrients which have positive effects on bird's health (Canogullari et al., 2009).

Economic feed efficiency

Economic feed efficiency (EE) for Bandarah chicks fed diet supplemented with propolis during growing period are presented in Table 8. Treated groups with propolis gave more net revenue and feed economic efficiency than the control group. Chicks fed diet supplied with 450 mg propolis/kg diet were recorded the best economic efficiency.

CONCLUSION

Regarding present results, supplemented chick's diet with different levels of propolis improved growth performance, physiological, immunological, microbiological and anti-oxidative status. Also, propolis was effective in increasing net revenue and economic efficiency. Addition of 450 mg propolis/kg diet could be recommended for improving chick's health.

Table (1): Composition* and the nutritive value of the basal diets

Ingredients	%	Calculated Composition	
yellow Corn	63.90	Crude Protein, %	19.23
Soybean M. (CP, 44%)	32.10	ME, Kcal/kg	2872
Premix**	0.30	Crud fiber, %	3.20
NaCl	0.30	Ca, %	1.00
Di. Ca. phosphate.	1.80	P(va) , %	0.48
Limestone	1.40	Ly, %	1. 00
DL-methionine (Meth)	0.20	Methionine %	0.48
Total	100	Met. + Cyct.	0.81

*****As recommendation of Anim. Prod. Res. Inst., Agric Res. Center, Minis. Of Agric., (2001).
**Composition of premix in 3 kg is: Vit. A 10,000,000 IU, Vit. D_3 2,000,000; Vit. E 10,000 mg, Vit. K_3 1,000 mg, Vit. B_1 1,000 mg, Vit. B_2 4,000 mg, Vit. B_6 1,500 mg, Vit. B_{12} 10 mg; Niacin 20,000 mg; Pantotenic acid 10,000 mg, Folic acid 1,000 mg, Biotin 50 mg, Choline chloride 500, 000 mg, Cu 3,000 mg, Iodine 300 mg, Fe 30,000 mg; Mn 40,000 mg, Zn 45,000 mg, Selenium 100 mg.

Table (2): Effect of supplementing diet with propolis on body weight and body weight gain of Bandarah chicks

Propolis levels (mg/kg diet)	Body weight (g)				Body weight gain (g)			
	1 day	4 wks	8 wks	12 wks	(0 - 4)	(4 - 8)	(8 - 12)	(0 - 12)
0	35.2	208.2^{d}	491.13^{d}	989.73^{d}	173.00^{d}	282.93^{c}	498.60^{c}	954.53^{d}
150	35.4	221.6^{c}	529.27^{c}	1057.53^{c}	186.20^{c}	307.67^{b}	528.27^{b}	1022.13^{c}
300	35.27	248.53^{b}	592.93^{b}	1103.33^{b}	213.27^{b}	344.40^{a}	510.40^{c}	1068.07^{b}
450	35.8	263.23^{a}	615.2^{a}	1182.10^{a}	227.43^{a}	351.97^{a}	566.90^{a}	1146.30^{a}
Pooled SEM	0.34	2.82	2.38	3.51	2.68	4.05	4.26	3.41
Sig	NS	**	**	**	**	**	**	**

a, b, c, d, Means in the same column with different superscripts, differ significantly ($p<0.05$). Sig. = Significance, ** ($p<0.01$). NS = Not Significant. SEM = standard error mean.

Table (3): Effect of supplementing diet with propolis on feed consumption and feed conversion ratio of Bandarah chicks.

Propolis levels (mg/kg diet)	Feed consumption (g/chick/day)				Feed conversion ratio (g feed/g gain)			
	(0- 4)	(4 - 8)	(8 - 12)	(0 - 12)	(0 - 4)	(4 - 8)	(8 - 12)	(0 - 12)
0	24.67	44.03	60.73^{a}	43.13	3.99^{a}	4.35^{a}	3.41^{a}	3.79^{a}
150	26.03	45.2	55.70^{b}	42.3	3.91^{ab}	4.12^{a}	2.95^{b}	3.48^{b}
300	25.17	43.9	52.27^{c}	40.47	3.32^{bc}	3.57^{b}	2.87^{b}	3.18^{c}
450	24.8	45.1	52.13^{c}	40.67	3.06^{c}	3.60^{b}	2.57^{c}	2.98^{d}
Pooled SEM	1.44	1.08	0.76	0.88	0.19	0.14	0.06	0.06
Sig	NS	NS	**	NS	*	*	**	**

a, b, c, d, Means in the same column with different superscripts, differ significantly ($p<0.05$). Sig. = Significance, *($p<0.05$), ** ($p<0.01$). NS = Not Significant. SEM = standard error mean.

Table (4): Effect of supplementing diet with propolis on carcass relative weight and the percentage of some carcass traits of Bandarah chicks

Propolis levels (mg/kg diet)	Carcass	Gizzard	Liver	Heart	Spleen	Bursa	Thymus
0	64.78^{c}	1.51	2.04	0.49	0.147^{c}	0.197^{c}	0.424^{c}
150	67.20^{b}	1.53	1.96	0.51	0.166^{b}	0.220^{b}	0.454^{b}
300	69.90^{a}	1.66	1.98	0.51	0.187^{a}	0.243^{a}	0.491^{a}
450	71.65^{a}	1.55	2.03	0.50	0.192^{a}	0.245^{a}	0.509^{a}
SEM	0.10	0.03	0.02	0.01	0.002	0.001	0.001
Sig.	**	NS	NS	NS	**	**	**

a,b, c, Means in the same column with different superscripts, differ significantly ($p<0.05$). Sig. = Significance, ** ($p<0.01$). NS = Not Significant. SEM = standard error mean.

Table (5): Effect of supplementing diet with propolis on hematological parameters of Bandarah chicks

Parameters	Propolis levels (mg/kg diet)				SEM	Sig.
	0	150	300	450		
Hb (g/dl)	9.39 ^{d}	10.21^{c}	11.94 ^{b}	12.02 ^{a}	0.02	**
RBCs (10^6/mm^3)	2.08 ^{d}	2.48 ^{c}	2.95 ^{b}	3.04 ^{a}	0.01	**
PCV (%)	30.27 ^{d}	34.03 ^{c}	36.14 ^{b}	36.75 ^{a}	0.02	**
WBCs (10^3/mm^3)	4.37 ^{d}	4.97 ^{c}	5.13 ^{b}	5.50 ^{a}	0.01	**

a, b, c, d, Means in the same row with different superscripts, differ significantly ($p<0.05$). Sig. = Significance, ** ($p<0.01$). SEM = standard error mean. Hb= hemoglobin; RBC= red blood cells; PCV= packed cell volume; WBC= white blood cells.

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Table (6): Effect of supplementing diet with propolis on blood biochemical constituents of Bandarah chicks

Parameters	Propolis levels (mg/kg diet)				SEM	Sig.
	0	150	300	450		
Total protein (mg/dl)	4.31^{c}	4.98^{b}	5.82^{a}	5.82^{a}	0.02	**
Albumin (mg/dl)	2.42^{d}	2.77^{c}	2.98^{b}	3.20^{a}	0.03	**
Globulin (mg/dl)	1.89^{d}	2.21^{c}	2.84^{a}	2.62^{b}	0.01	**
Total lipids (mg/dl)	368.67^{a}	338.67^{b}	318.04^{c}	297.33^{d}	1.82	**
Cholesterol (mg/dl)	157.00^{a}	146.07^{b}	135.14^{c}	132.00^{c}	1.30	**
Triglyceride (mg/dl)	138.68^{a}	122.75^{b}	103.03^{c}	100.04^{c}	1.11	**
AST (U/L)	87.83^{a}	79.60^{b}	66.57^{c}	65.10^{c}	0.30	**
ALT (U/L)	39.57^{a}	33.13^{b}	30.70^{c}	29.97^{c}	0.20	**

a, b, c, d, Means in the same row with different superscripts, differ significantly ($p<0.05$). Sig. =Significance, ** ($p<0.01$). SEM = standard error mean.

Table (7): Effect of supplementing diet with propolis on coliform bacteria in intestine of Bandarah chicks

Propolis levels (mg/kg diet)	Aerobic plate count	Total coliform count	Total anaerobic count
0	14×10^3	31×10^4	6 x 101
150	6×10^2	11×10^2	-Ve
300	5×10^1	7×10^1	-Ve
450	4×10^1	6×10^1	-Ve

-Ve = negative

Table (8): Effect of supplementing diet with propolis on feed economic efficiency of Bandarah chicks

Items	Propolis levels (mg/kg diet)			
	0	150	300	450
Total feed consumption/chick (kg)	3.623	3.553	3.400	3.416
Price of propolis(L.E)	0.000	0.53	1.02	1.54
Total feed cost/chick (L.E)	12.68	12.43	11.90	11.97
Total cost(propolis+feed)	12.68	12.96	12.92	13.51
Average body weight gain/chick (kg)	0.955	1.022	1.068	1.146
Selling price (L.E)	18.15	19.42	20.29	21.77
Net revenue /chick	5.46	6.46	7.37	8.26
Economic efficiency (EE)	43.10	49.85	57.04	61.21
Relative (REE)	100.00	115.62	132.39	142.93

L.E= Egyptian pound. Feed cost/kg= 3.50 L.E. Price of one gram of propolis= 1 L.E.
Price/kg body weight=19 L.E. EE= (Net revenue/T. cost). REE, assuming control treatment= 100.

Fig. (1): Effect of supplementing diet with propolis on plasma IgG and IgM of Bandarah chicks

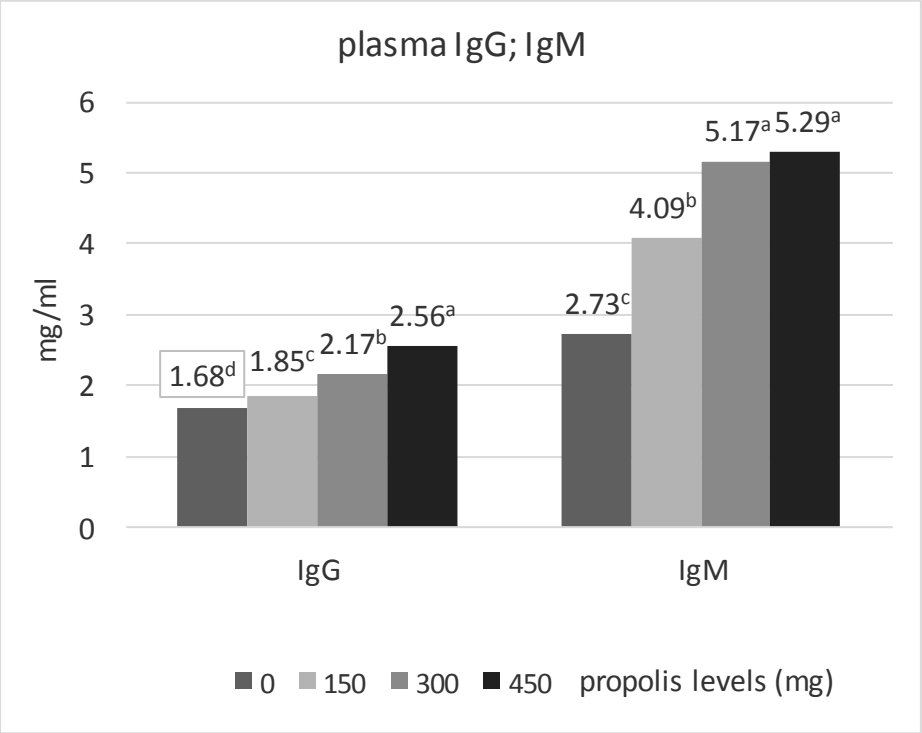
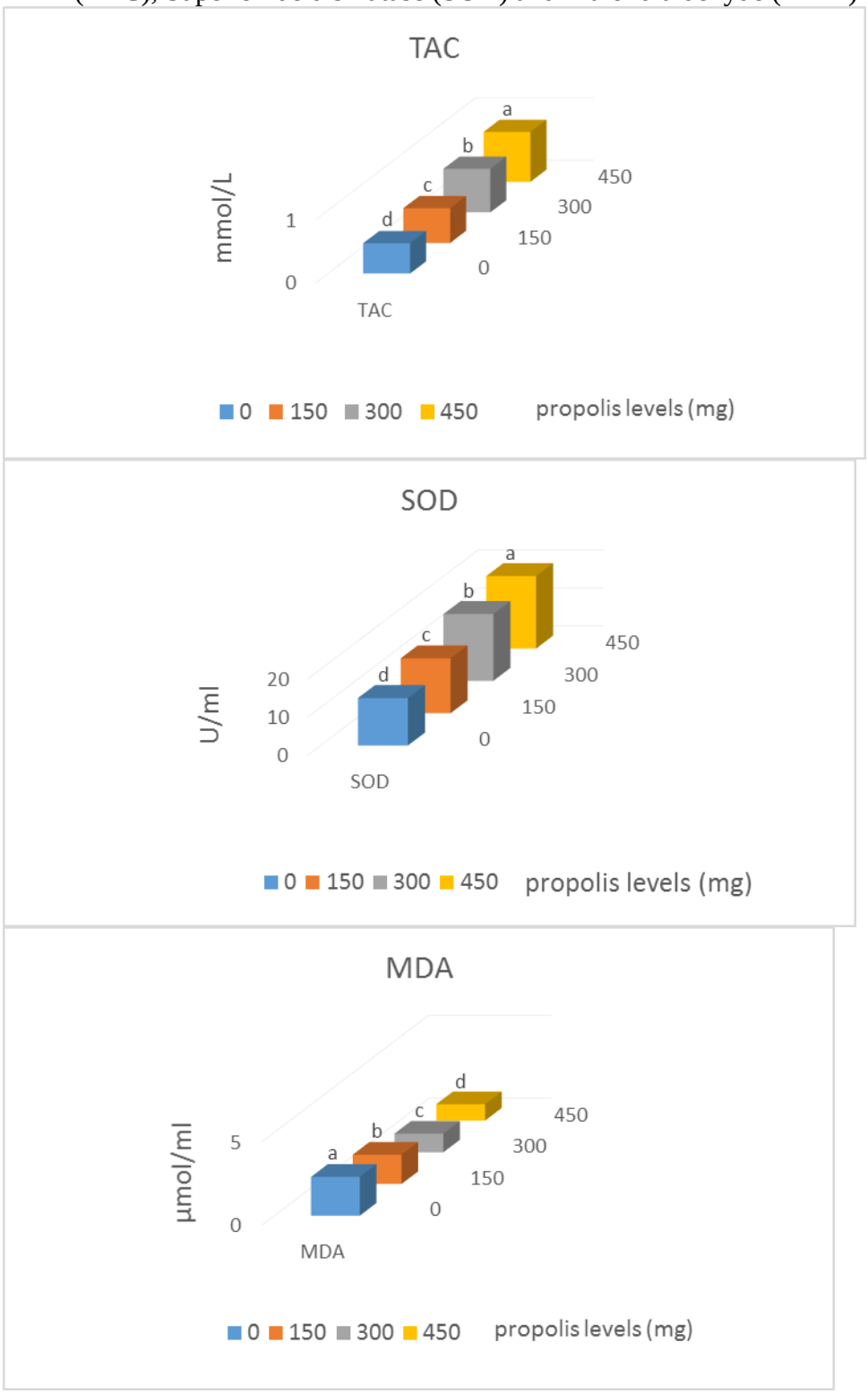


Fig. (2): Effect of supplementing diet with propolis on plasma Total antioxidant capacity (TAC), Super oxide dismutase (SOD) and Malondialdehyde (MDA) on chicks



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الملخص العربى

تأثير اضافة البروبوليس على أداء كتاكيت البندرة

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اجريت هذه التجربة لدراسة تأثير اضافة البروبوليس على اداء كتاكيت البندرة. 360 كتكوت بندرة عمر يوم غير مجنس تم توزيعها عشوائيا الى اربع مجاميع كل مجموعة بها ثلاث مكررات كل مكررة بها 30 كتكوت. وتمت التربية فى بطاريات حتى عمر 12 اسبوع. تغذت الكتاكيت فى المجموعة الاولى على العليقة الكنترول بدون اضافات والثلاث مجاميع الاخرى تحتوى على 150 ، 300 و450 ملجم بروبوليس/كجم علف. واظهرت النتائج زيادة كل من وزن الجسم والزيادة فى وزن الجسم بزيادة مستوى البروبوليس فى العلف. لم يتأثر معدل استهلاك العلف باضافة البروبوليس فى الفترات الاولى من التجربة (0-4) و(4-8) و (0-12) بينما انخفض معدل استهلاك العلف فى الفترة من (8-12) اسبوع من العمر مقارنة بالكنترول. وسجلت افضل كفاءة غذائية عند استخدام المستوى المرتفع من البروبوليس (450ملجم) حيث زادت بنسبة 21.37% . واوضحت النتائج زيادة معنوية فى نسبة الذبيحة و الاعضاء اليمفاوية (الطحال- غدة البرسا- الغدة التيموسية) فى المجاميع المعاملة مقارنة بالكنترول. وجدت زيادة معنوية فى قيم الهيموجلوبين و الهيماتوكريت وكرات الدم الحمراء عند اضافة البروبوليس فى عليقة كتاكيت البندرة. ارتفع عدد كرات الدم البيضاء بنسبة 13.73، 17.39و25.86 عند المستويات 150و300و450 ملجم بروبوليس مقارنة بالكنترول. واوضحت النتائج زيادة فى كل من بروتينات الدم والالبيومين والجلوبيولين وايضا زادت جلوبيولينات المناعة. ولوحظ انخفاض فى الدهون الكلية والكوليستيرول والدهون الثلاثية فى بلازما الدم نتيجة استخدام البروبوليس فى العلف. ومن الملاحظ زيادة فى انزيمات مضادات الاكسدة وتحسن كفاءة الكبد فى المجاميع المعاملة مقارنة بالكنترول. اضافة البروبوليس الى عليقة كتاكيت البندرة ادى الى انخفاض معنوى فى انزيم مالوندای الديهايد وايضا انخفض المحتوى الميكروبى للامعاء. سجلت المجموعة التى تغذيت على المستوى المرتفع من البروبوليس على اعلى كفاءة اقتصادية.

ونستخلص من نتائج هذه الدراسة ان اضافة البروبوليس الى عليقة الكتاكيت كان له تأثير ايجابى على كل من معدلات النمو والحالة الفسيولوجية والمناعية . ونوصى باضافة 450 ملجم بروبوليس/كجم علف من اجل تحسين صحة الكتاكيت والحصول على اعلى كفاءة اقتصادية .