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Biochemical Profile, Oxidative Status and Immunological Response of Broiler Chicks Fed Commercial Natural Growth Promoters-Supplemented Diets

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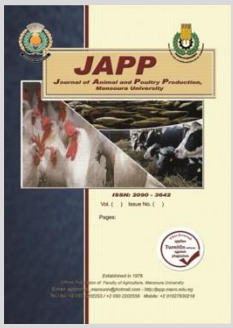

ABSTRACT

The current experiment was directed to examine the beneficial impacts of dietary enrichment with commercial probiotics (Provilacc) on performance, Biochemical profile, oxidative status and Immunological response, antibody titers against avian flu virus (AFV) and Newcastle disease virus (NDV) in chickens. In this experiment, 200 day- old unsexed Hubbard broilers were randomly distributed to four equal experimental groups (0.0, 0.5, 0.75 and 1.0 g Provilacc /kg diet) , each of which include 5 equal replicates. High level of commercial natural growth promoters were (1.0 g/kg diet) had a positive effect on LBW, BWG and FCR whilst feed intake was slightly enhanced comparison with the control one. Also, Blood plasma concentrations of cholesterol (Chol), low density lipoprotein cholesterol (LDL) and high density lipoprotein cholesterol (HDL) had differed significantly between the control and provilacc-supplemented groups. Also, provilacc supplementation in the diet could improve thyroid function. In addition, supplementing provilacc had a significant positive effect on liver function (AST, ALT and AlkP), SOD, MDA and antibody titers against NDV and AFV. The outcome of the present work show that adding provilacc (commercial natural growth promoters) to diets of Hubbard chicks up to 1.0g/kg diet has a helpful effect on oxidative status and Immunological response, antibody titers against avian flu virus (AFV) and Newcastle disease virus (NDV) under normal conditions.

Keywords: Hubbard chicks, Immunological response, oxidative status, thyroid hormones.

INTRODUCTION

Effectiveness in poultry production is depends on the harmony between animal welfare, nutrition and intestinal health (Almeida Paz *et al*., 2019). Antibiotic has been lengthily utilized since the 1940s to develop the immunocompetence of broiler as growth promoters and against communicable diseases. Tania *et al*. (2018) reported that utilizing Antibiotics for lengthy terms might prompt the expansion of microorganisms impervious to drugs, which are able to move to humans. The WHO (1997) (World Health Organization) and the Economic and Social Committee of the European Union (1998) reasoned that use of against microbial in feed poultry is a community healthiness anxiety. Inside the later quite a while, the significance of gut wellbeing related with an even gut microflora has been perceived as a principal precondition for cost-effective and ecological sound poultry creation. At present, a great number of natural growth promoters are accessible on the market, such as enzymes, probiotics, prebiotics, and phytobiotics.

Probiotics is a live microbile feed addition which benefits the host poultry by humanizing it's intestinal tract balance (Ismail *et al*,. 2011 and Abo El-Maaty *et al*., 2017). Probiotics are being considered to fill this hole and as of now a few farmers are utilizing them in inclination to antibiotics (Lutful Kabir, 2009).

A incredible bargain of consideration has as of late been gotten from nutritionists and veterinary specialists for legitimate use of supplements and the utilize of probiotics for development advancement of poultry In broiler nourishment, probiotic species belonging to *Aspergillus*, *Streptococcus*, *Lactobacillus*, *Bacillus*, *Enterococcus*, *Bifidobacterium*, *Saccharomyces* and *Candida* have a positive outcome on chicks performance (Ashayerizadeh *et al*.,2009) , pathogen inhibition and modulation of intestinal microflora (Mountzouris *et al*., 2007), certain haematobiochemical parameters (Mathivanan and Kalaiarasi., 2007), immunomodulation (Apata, 2008). The use of Probiotics in order to stop and decrease colonization of harmful bacteria, reduce ammonia excretion, regulate gut pH, prevent stress of various etiology, maintain intestinal integrity, improve performance of birds, improved growth rate, better utilization of nutrients, stimulation of immunity and better antioxidant status (Abo El-Maaty *et al*. 2014, Bhatt *et al*., 2017 and Sherif *et al*., 2019). This research was undertaken to determine the effect of feeding commercial probiotics (Provilcc) at different levels on the Hubbard broilers performance, oxidative status, Biochemical profile and Immunological response, antibody titers against avian flu virus (AFV) and Newcastle disease virus (NDV) under normal conditions.

MATERIALS AND METHODS

Our trial of this examination was completed at the Poultry Production Farm; Center of Agricultural Research and Experiments, Faculty of Agriculture, Mansoura, University. The purpose of this trial was to estimate the

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impact of added dietary commercial probiotics (Provilcc) on growth performance, Biochemical profile, oxidative status and Immunological response, antibody titers against avian flu virus (AFV) and Newcastle disease virus (NDV) under normal conditions.

Examination diets:

Starter and grower tested diets composed mostly of yellow corn, soybean meal and corn gluten meal were formulated to guarantee a satisfactory admission of all nutrients for chicks, as suggested by the National Research Council (NRC, 1994), for both starting and growing periods. The composition and calculated analysis of the examined diets are obtainable in Table 1. The commercial probiotics (Provilcc) was supplementary to the basal diet at diverse levels as follows:

1-Basal Diet only without addition (control)
2-Basal Diets+ commercial probiotics (Provilcc) 0.50 g/kg diet.
3-Basal Diets+ commercial probiotics (Provilcc) 0.75 g/kg diet.
4-Basal Diets+ commercial probiotics (Provilcc) 1.0 g/kg diet.

Composition of commercial probiotics (Provilcc): each Kg contains:

Saccharomyces cerevsiae 5855 billion CUF, *Lactobacillus sporogenes* 14040 million CUF, *Lactobasillus acidophilus* 14040 million CUF and *Bacillus subtilis* 15000 million CUF

Birds and management:

200 one-day-old unsexed Hubbard chicks were used in this study up to 42 day-old. The chicks were weighed and arbitrarily divided into 4 equivalent trial groups in open-sides house (each one subdivided into 5 replicates with 10 chicks in each replicates). Chicks were housed in battery cages (100 X 50X 50cm). Chicks were received four experimental starter diets [metabolizable energy (ME) of 3100 kcal/kg and 23% crude protein (CP)] from one to 21-day-old. After that, they were switched to examine grower diets (ME of 3100 kcal/kg and 21% CP) from 22 to 42-day-old. Water and feed were available ad libitum all over the experimental period. All groups were subjected to 23 hours light and one hour darkness. All the trial birds were raised underneath alike environmental, managerial and hygienic conditions. The installation and chemical analysis of the control starter and grower diets are showing in Table 1.

Measurements:

Live body weight (LBW), body weight gain (BWG) and feed intake (FI) have been considered weekly during the trial period, after that feed conversion ratio (FCR) was calculated (g feed :g gain). Viability and mortality had been visually spotted and recorded daily at the whole time of the trial time.

Blood sampling and Serum biochemical analysis:

Five chicks of every treatment were randomly selected, slaughtered and blood samples were collected into centrifuged tubes; then they were centrifuged at 3000 rpm for 20 min. and the serum obtained was stored at -20o C awaiting analysis. Prepared frozen serum samples were analyzed spectrophotometrically according to the enclosed pamphlets for colorimetric estimation of alanine aminotransferase (ALT) and aspartate aminotransferase (AST) (Randox, UK).

Table 1. Composition and calculated chemical analysis of the experiential diets

Ingredients %	Starter diet* (0-21 days)	Grower diet* (22-42 days)
Yellow corn	64.0	70.2
Soybean meal (44%)	12.0	10.0
Corn gluten meal 60%	19.00	15.0
Di-calcium phosphate	1.80	1.80
Limestone	2.00	2.00
Salt (Nacl)	0.30	0.30
DL-Methioine	-	0.20
L-lysine Hcl	0.60	0.40
Vitamin α Min. Mix**	0.30	0.30
Total	100.00	100.00
Calculated chemical analysis ***		
Crude protein %	23.10	20.04
ME (Kcal/Kg)	3140	3147
Ether extract %	3.00	3.12
Crude fiber %	2.50	2.44
Calcium %	1.19	1.18
Available phosphorus %	0.45	0.44
Lysine %	1.15	0.92
Methionine %	0.47	0.41
Methioine +cysteine %	0.88	0.77

****Composition of vitamin and minerals premix. Each 3Kg of premix containing : 15000000 I.U.vit, A, 50 g. vit E, 3000 mg.vit.$K_3$3000 mg B1, 8000mg. Vit.B_2 4000mg, vit.B6, 20mg vit. B_{12}, 15000mg. pantothenic acid, 60000 mg. Niacin, 1500 mg. Folic acid, 200mg. Biotin, 200000 mg vitc, 700mg. choline choloride, 80gm Mn, 80g. Zn, 60gm, Iron, 10gm. Cu, 1gm. Cu, 1gm. Iodine and 0.2gm selenium, where Ca Co_3 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).**

***Starter and grower T2, T3 and T4 diets are the same control diets but supplemented with 0.50g Provilcc, 0.75g Provilcc and 1.00g Provilcc/kg diet respectively.**

Total protein and albumin were detected using Stanbio (USA) kits. Cholesterol (Chol), triglycerides (TG) and high-density lipoprotein cholesterol (HDL-C) levels were determined by kits obtained from Spinract, Spain. Superoxide dismutase (SOD), catalase (CAT), reduced glutathione (GSH), total antioxidant capacity (TAC) and malondialdehyde (MDA) were estimated in serum sample (Biodiagnostic, Egypt). In addition, the thyroid hormones (T3 and T4) and immunoglobulin (IgG, IgM, and IgA) were also resolute. Avian flu virus (AFV) and antibody titers against Newcastle disease virus (NDV) were resolute by hemagglutination inhibition technique by means of U-Bottom microtiter plates (96 wells) as explained by Wegmann, and Smithies (1966) and Van der Zijpp *et al.* (1983).

Yield of the Carcass

At 6-week of age, 5 broilers per treatment were randomly selected, submitted to 12 h of feed withdrawal. All broilers were weighed and slaughtered. After slaughter, the carcass was defeathered and eviscerated manually. The hot carcass weight was recorded; also, the heart, liver, gizzard, spleen and abdominal fat were recorded. Next, carcass yield was calculated as a percentage in relation to live weight.

Histological sections preparation:

At the end of the experiment, representative tissue specimen from ileum of threes chicks per treatment group was dissected during the slaughtering time. After being fixed in 10% formalin saline solution for 24h, they were

dehydrated, cleared and embedded in paraffin wax. Then transverse sections (T.S) of 4-5 micron thick were mounted in glass slided, and stained with hematoxyllin and eosin stains (H&E). All sections were examined underneath light microscope and then photographed by digital camera.

Statistical analysis:

Statistical investigation for the acquired data was performed by two-way analysis of variance utilizing the method of least square analysis of Co-variance (SAS, 2006). Duncan's multiple range test was used to isolate significant contrasts among means (Duncan, 1955).

RESULTS AND DISCUSSION

Growth performance: -

Our data concerning to the impact of dietary commercial probiotics (Provilcc) levels on body weight and feed consumption of chicks at 6-wks-old are exposed in Table 2. In our study, high level of add commercial probiotics (Provilcc) (up to 1.0 g/kg diet) enhanced means of LBW, BWG, feed consume and positively affected FCR ($P<0.05$). The useful effects of probiotics may be a live microbial feed addition which benefits the host poultry by humanizing it's intestinal balance. This effect is in accord with those of Almeida Paz *et al. (*2019), who found that feeding on a diet enriched with probiotic (dose recommended by the manufacturer) resulted in a better results in the performance broiler chicks. Jin *et al.* (1998) observed a significant enhance in the weight of chicks fed with various levels of probiotics comparison with the control group. The positive effect of probiotics on chick weight was also reported by other researchers, e.g. Midilli and Tuncer (2004) and Kabir *et al.* (2004). However, others did not observe such an increase in chick weight (Khbaksefidi and Rahimi (2004) and Kafilzadeh and Safari Parvar (2003)). Cengiz *et al*., (2015) reviewed that chicks fed probiotic enrichment diet had significantly superior the feed consume and weight gain in starter period only. Aziz Mousavi *et al.,* (2018) reviewed that the application of probiotics in the feed of broilers can lead to positive outcomes such as enhanced weight and improved feed conversion ratio (FCR). Al-Khalaifa *et al*., (2019) demonstrated that there was no impact of the dissimilar prebiotic and probiotics on the production performance of chicks fed *Lactobacillus* (1 g/kg dried culture of 12 commercial strains) and *Bacillus coagulans* (1 g/kg dried culture). In contrast, Sarangi *et al.,* (2016) fed 360 VenCobb broilers (one-day of age) with diets comprising of control and basal diets enhanced with prebiotics and probiotics had a lower body weight than those fed control diets. Ghasemi *et al*., (2014) indicated that the feed consume of the chicks was not influenced at all by fed control diet, basal diet-enhanced with a probiotic, a prebiotic, a synbiotic and black cumin seed. All trial broiler chicks appeared healthy and no mortality registered through the examination period.

Yield of the Carcass:

In the present study, Dietary supplementation of deferent levels of commercial probiotics (Provilcc) had a significant effect on carcass yield, and weight of front parts (FP), hind parts (HP), liver and Gizzard compared with the control once (Table 3). Similarly, explained by Novak *et al*. (2011) and Ismail *et al.,* (2011) who indicated significantly better carcass yield, and breast and thigh meat weights. However, contrasting studies were uncovered that dietary probiotic botched to increase carcass yield of chicks fed probiotic-added diets (Pelicano *et al.,* 2005; Karaoglu and Durdag, 2005).

Table 2. Growth performance of 6 weeks of age Hubbard chicks as affected by dietary supplementation with different levels of probiotic (provilacc).

Items	Dietary treatments				SEM	Significance level
	T1 Control	T2 0.50 g provilacc /kg diet	T3 0.75 g provilacc /kg diet	T4 1.0 g provilacc 2.0 /kg diet		
			Body weight (g)			
Initial, 1 day	43.72	43.96	43.84	44.02	0.113	NS
42 days	1867.6^{b}	2112.6^{a}	2182^{a}	2250.3^{a}	0.034	**
			Body weight gain (g)			
42 days	1823.88^{b}	2068.64^{a}	2138.16^{a}	2206.28^{a}	0.341	**
			Feed intake (g)			
42 days	3189.39^{ab}	3209.19^{a}	3092.68^{b}	3119.57^{ab}	0.055	*
			Feed conversion (g feed/g gain)			
42 days	1.75^{c}	1.55^{bc}	1.45^{b}	1.41^{a}	0.006	**

a,b,c:Means in the same raw with different superscripts in the same raw are significantly($P<0.05$) different.
N.S.:non-significant.

Table 3. Carcass yield of 6-wks-old unsexed Hubbard chicks as influenced by dietary enrichment with different levels of probiotic (provilacc).

Treatments	LBW[1] (g)	CY[2] (%)	FP[3] (%)	HP[4] (%)	Liver (%)	Heart (%)	Gizzard (%)
0.0 g provilacc/kg diet (T1)	1867.6^{b}	67.86^{b}	38.19^{b}	29.67	2.21^{a}	0.471	1.79^{a}
0.50 g provilacc/kg diet (T2)	2112.6^{a}	70.18^{a}	40.51^{ab}	29.67	1.91^{b}	0.432	1.51^{b}
0.75 g provilacc/kg diet (T3)	2182^{a}	71.22^{a}	41.31^{ab}	29.91	1.94^{b}	0.445	1.46^{b}
1.0 g provilacc/kg diet (T4)	2250.3^{a}	71.74^{a}	41.69^{a}	30.05	1.96^{b}	0.472	1.49^{b}
SEM	21.79	0.453	0.531	0.511	0.083	0.02	0.079
Significance level	**	*	*	NS	*	NS	*

1-4: Refer to live body weight at slaughter,carcass yield,front parts and hind parts,respectively.
a-c: For each of the main effects, means bearing different superscripts differ significantly ($P\leq0.05$).
NS:Not significant, *:Significant at $P<0.05$, and SEM:Standard error of the means.

Biochemical Parameters and Endocrine Response:

As found in Table 4and 5, no relevant changes were found in the serum activities of GSH, as well as serum levels of TP, Alb, Glob and A/G ratio in the different examined groups. Conversely, serum Choles, Trigl, HDL level was significantly (P≤0.05) increased in all supplemented experiments contrast with the control. These findings are in conventionality with those of Dimcho *et al.* (2005) who indicated that probiotic addition did not influence the total proteins concentrations of chicks.

On the contrary, serum LDL level was significantly (P≤0.05) reduced in commercial probiotics (Provilcc) treated groups comparison with the control group. Serum activities of ALT, AST and AlkP were significantly (P≤0.05) decreased in all commercial probiotics (Provilcc)-supplemented groups with respect to the control one.

Serum T3 and T4 levels were significantly increased in commercial probiotics (Provilcc)-enhanced groups, where the lowest level was recorded in broiler chicks fed basal diet. serum T3 level was significantly elevated upon dietary supplementation either with 0.75 g Provilcc. Serum T4 level was elevated (P < 0.05) only in broiler chicks fed 0.75g Provilcc-enhanced diet.

Oxidative Stress and Antioxidant Biomarkers

The influences of dietary commercial probiotics (Provilcc) supplementation on oxidative stress and antioxidant status are table 5. The serum GSH level insignificantly varied among the experimental groups. Meanwhile, chicks fed diets supplemented with commercial probiotics (Provilcc) showed a marked reduction in the serum MDA level compared with the control groups. The serum SOD activity level in chicks fed commercial probiotics (Provilcc)-supplemented diets, was significantly (P≤0.05) increased in dietary Provilcc group comparison with the control one.

Response to AFN Antigen and NDV

AVF antibody titers and NDA are shown in Table 4. Hubbard chicks fed commercial probiotics (Provilcc)-supplemented diets had a higher (P≤0.05) antibody production (the antibody titers against NDV and AFV in serum plasma) than control birds suggesting that there may be the useful effects of probiotics may be medicated by stimulation of immunity. In conclusion, the probiotic including *Bacillus subtilis* had positive impact on immune system and performance of broiler chicks. Panda *et al.*(2000) supplemented diet with various level of probiolac probiotic (a commercial probiotic mixture of lactic acid bacteria, *Aspergillus oryzae* and *Torulopsis*) and observed the significant increase in antibody production at 10 days of PI when SRBC was infused at 2-wks of age and at 5 days of PI when SRBC was injected at 21 days. Khaksefidi and Ghoorchi (2006) explained that antibody production against Newcastle disease virus in 50 mg/kg probiotic added group of hubbard chicks was significantly superior at 10 days of post immunization comparison with the control. Kabir et al (2009) indicated that the effects of probiotics on immune reaction in the body of chicks and reviewed a significant increase in antibody production.

Immune Responses of Hubbard chicks fed Provilcc-supplemented diets

Feeding diet with different commercial probiotics (Provilacc) supplementations levels increased IgM and IgG activity but IgA not affected compared to control group. While, chicks fed diet supplemented with 0.75g provilacc and 1.0 g provilacc had significantly higher IgG and IgM than other groups (Table 4).

Table 4. Immunity status, thyroid hormones and the production antibody titers against AFN and NDV of 6-week-old unsexed Hubbard chicks as influenced by dietary enrichment with different levels of probiotic (provilacc).

Items	Dietary treatments				SEM	Significance level
	T1 Control	T2	T3	T4		
Total protein (g/dl)	3.91	4.21	4.33	4.32	0.056	NS
Albumin (g/dl)	2.19	2.31	2.42	2.39	0.068	NS
Globulin (g/dl)	1.72	1.90	1.91	1.93	0.063	NS
A/G ratio	1.27	1.22	1.27	1.24	0.061	NS
IgG (mg/dL)	423.69 ^{c}	451.29 ^{b}	531.33 ^{a}	531.61 ^{a}	11.135	**
IgM (mg/dL)	171.18 ^{b}	190.83 ^{b}	245.19 ^{a}	254.51 ^{a}	1.387	*
IgA (mg/dL)	112.93	128.13	138.28	134.87	1.245	NS
T4	17.83 ^{b}	21.09 ^{ab}	21.83 ^{a}	20.39 ^{ab}	0.338	*
T3	3.21 ^{c}	4.61 ^{b}	5.08 ^{a}	4.62 ^{b}	0.109	**
AFN (log^2)	4.11^{b}	4.63^{a}	5.09^{a}	5.01^{a}	0.212	*
NDV (log^2)	5.57^{b}	6.92^{a}	7.01^{a}	7.06^{a}	0.205	*

a,b,c Means in the same raw with different superscripts in the same raw are significantly(P<0.05) different.
N.S. : non-significant. T1: control, T2:0.50g provilacc ,T3: 0.75 g provilacc, T4: 1.0 g provilacc/kg diet

Table 5. Liver function, antioxidant status and lipped profile of 6-week-old unsexed Hubbard chicks as influenced by dietary enrichment with different levels of probiotic (provilacc).

Dietary Treatments	AST (IU/L)	ALT (IU/L)	AlkP (U/dL)	MDA µmol/ ml	SOD U/ml	GSH µmol/ ml	Choles mg/dl	Triglycr mg/dl	HDL mg/dl	LDL mg/dl
T1	18.97 ^{a}	201.6^{a}	65.42 ^{a}	8.75^{a}	14.03^{c}	23.93	103.0^{b}	97.83^{b}	31.00 ^{b}	62.33 ^{a}
T2	12.41 ^{b}	193.1^{a}	46.18 ^{b}	6.21^{b}	18.57^{b}	24.74	114.2^{a}	92.97^{c}	36.00 ^{a}	49.93 ^{b}
T3	9.01 ^{c}	151.2^{d}	43.08 ^{c}	5.83^{c}	23.74^{a}	24.82	116.7^{a}	101.32^{a}	35.67 ^{a}	50.51^{b}
T4	8.07 ^{d}	115.4^{c}	42.22 ^{c}	5.45^{d}	23.83^{a}	25.00	113.0^{a}	102.57^{b}	37.24 ^{a}	49.03 ^{b}
SEM	0.637	1.133	1.412	0.122	0.341	0.076	1.341	1.122	0.644	1.518
Significance level	*	*	*	*	*	NS	*	*	*	*

Means within the same column having different superscripts differ significantly(P≤0.05).
T1: control, T2:0.50g provilacc ,T3: 0.75 g provilacc, T4: 1.0 g provilacc/kg diet

Histological examination of ileum sections:

Histological examination of ileum sections showed marked changes in the mucosal layer structure. It is clear that the villi height and width of ileum from the control chicks (Fig.1) were shorter with a thin layer of crypts which appeared as small unicellular glanols. This indicates mal-absorption phenaminae-related to villus height decrease. This case was also, but with lesser extent, observed in Fig.2 where the villi height was also decreased but with more developed crypts. However, the villi height and crypts development have showed considerate increases in sections from T3 chicks (Fig.3) and T4 treatment (Fig.4). This indicates fast proliferation and regeneration of mucosal epithelial lining of the villi and an increase in the secretory activity of the crypts goblet and mucous cells, which may reflect enhanced growth performance of those groups of chickens.

Abo-Elmaaty *et al.* (2019) detailed that the villi shape and size of growing rabbits were significantly influenced by symbiotic-enhanced diet. This is demonstrative of a diminished host dependence on mucus secretion for protection. In the investigation of Ferket *et al.* (2002), contrary to expectations, antibiotic therapy increased goblet cell numbers. Decreasing numbers of viable Gram-positive species, such as *Bifidobacteria* and *Lactobacilli* may also raise the attendance of Gram-negative bacteria. An expansion in these kinds of microorganisms might likewise really require the requirement for superior mucus production and therefore more goblet cells (Edens *et al.*, 1997).

Effects of commercial natural growth promoters-Supplemented diets on broiler chicks ileum histological observations.

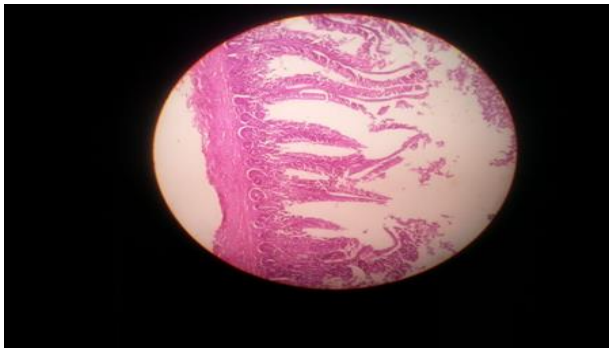

Fig .1. T.S. through the wall of ileum from broiler fed 0.0 g provlacc supplemented diet (control) (H×10).

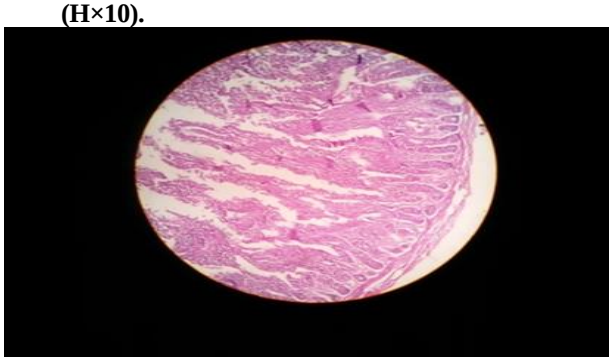

Fig .2. T.S. through the wall of ileum from broiler fed 0.5 g (control) provlacc supplemented diet (H×10).

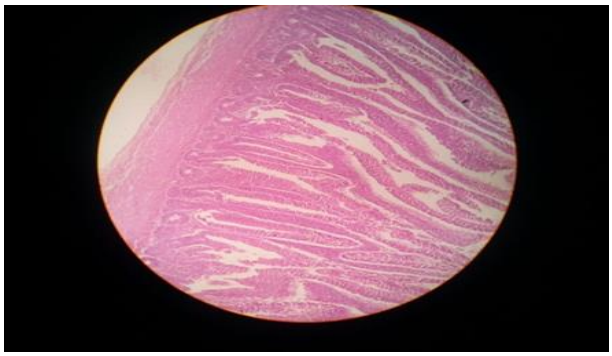

Fig .3. T.S. through the wall of ileum from broiler fed 0.75 g provlacc supplemented diet (H×10).

Fig .4. T.S. through the wall of ileum from broiler fed 1.0 g provlacc supplemented diet (H×10).

CONCLUSION

The conclusion of present work recommend that dietary enhancement of provilacc (commercial natural growth promoters) at levels of 0.5, 0.75 or 1.0 g/kg diet has a useful result on productive performance, immunity and antioxidant status of hubbard chicks.

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القياسات البيوكيميائية والحالة التأكسدية والاستجابة المناعية لكتاكيت التسمين المغذاه على علائق مدعمة بمحفزات النمو الطبيعية التجارية

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أجريت هذه الدراسة بهدف تقييم آثر تدعيم العلائق بمنشط نمو حيوي تجاري (بروفى لاك) على الأداء الإنتاجى ونشاط الغدة الدرقية وبعض قياسات الدم (الأجسام المضادة لفيروس النيوكاسيل وفيروس أنفلونزا الطيور) وكذلك النشاط التأكسدي فى سيرم الدم والفحص الهستولوجى للفائفى لكتاكيت التسمين. وفى هذه الدراسة تم توزيع عدد 200 كتكوت تسمين من سلالة الهبرد عمر يوم وغير مجنس عشوائياً على 4 معاملات (صفر ، 0,5 ، 0,75 ، 1,0 جم بروفي لاك/كجم عليقة) وكل معاملة موزعة على خمس مكررات. وقد اتضح أن المستوى العالى من منشط النمو الحيوى التجاري (1جم بروفى لاك/ كجم عليقة) أدى إلى زيادة إيجابية فى كل من وزن الجسم الحى والزيادة فى وزن الجسم ومعامل التحويل الغذائى مقارنة بمعاملة الكنترول ، أيضاً اتضح من نتائج هذه الدراسة تأثر كل من الكوليسترول والدهون البروتينية عالية الكثافة ومنخفضة الكثافة معنوياً بين الكنترول ومعاملات البروفي لاك. كما اتضح أن تدعيم العلائق بالبروفي لاك أدى إلى تحسن فى وظائف الغدة الدرقية وإضافة لذلك فإن إضافة البروفي لاك صاحبها تأثير إيجابي المعنوية على نشاط إنزيمات الكبد ونشاط إنزيم السوبر أكسيد ديسميوتيز والمالون داى ألدهيد والأجسام المضادة لمرضى أنفلونزا الطيور والنيوكاسل. ويتضح من نتائج هذه الدراسة أن تدعيم علائق كتاكيت سلالة الهبرد (عمر يوم) بمنشط النمو الحيوى التجارى البروفي لاك حتى 1جم/كجم عليقة أدى لتأثيرات إيجابية على الخصائص التأكسدية والاستجابة المناعية والأجسام المضادة لمرضى أنفلونزا الطيور والنيوكاسل تحت ظروف التربية الطبيعية.