Al-Mukhtar Journal of Sciences 33 (4): 306-322, 2018

Effect of Probiotic, Prebiotic, Synbiotic and Medicinal Plants on Productive Performance of Broilers Fed on Different Levels of Protein

Majdi A. Kairalla [1], Abdalhakim A. Aburas [2] and kurmuan A. Omar[3]

[1]*Department of animal production-Faculty of Agriculture- University of Sebha, Libya*
[2]*Department of animal production-Faculty of Agriculture- University of Aljabal Algarby, Libya.*
[3]*Department of animal production-Faculty of Agriculture- University of Alexandria, Egypt*

Received: 20 September 2018 / Accepted: 6 December 2018
Doi: https://doi.org/10.54172/mjsc.v33i4.298

Abstract: The aim of this study was to investigate the response of broilers fed on test diets containing non-antibiotic growth promoters; Probiotic (Bio Plus 2B), Prebiotic (Techno Mos), Synbiotic, and medicinal herbs (Mixture of *Origanum majorana*, *Foeniculum vulgare*, and *Carum carvi* in ratio 1:1:1), each within two dietary protein levels (normal and low), on these broiler performance. The study was carried out at the Poultry Research Center, Faculty of Agriculture; Alexandria University, Egypt. The experimental period lasted for 42 days. A total number of 500 days from Cobb broiler chicks, with similar average live body weight, were randomly distributed into 10 treatments. Each treatment comprised of 5 replicates of 10 chicks each. Ten experimental diets were formulated to be approximately isocaloric and cover all nutrients required for broiler throughout two stages of growth periods, starter diets (1 - 21) and finisher diets (22 - 42) days of age. Ten experimental diets were consisting of two levels of crude protein (recommended or low (85% of recommended)) and five feed-additive programmes (control, probiotic, prebiotic, synbiotic and medicinal plants). In general, feeding broiler lower crude protein levels (-10% of NRC) resulted in poorer growth performance, which was partially compensated with the non-antibiotic additives. Among the additives, synbiotic had positively significant effects on FCR, BW.

Keywords: probiotic, prebiotic, synbiotic , medicinal plants , Performance, Broilers , Protein

INTRODUCTION

Feeding on sub-therapeutic levels of antibiotics have been historically a common practice in some sectors of the commercial broiler industry in order to promote growth performance, protect overall flock health, and prevent diseases (Goodarzi, Landy, & Nanekarani, 2013). However, the repeated use of antibiotics in poultry diets has resulted in severe problems such as higher resistance of pathogen to antibiotics, imbalance of normal microflora in the gut, reduction in beneficial intestinal microflora, and accumulation of antibiotics residue in animal products and consequently increasing the negative impact on the environment (Barton, 2000; Hinton, Kaukas, & Linton, 1986).

As Barton (2000) reported, the emergence of antibiotic resistance is closely related to the amount of antibiotic residues in the environment, as the resistance to antibiotics is increasing due to the misuse of antibiotics as growth promoters (AGP) in animal feeds as well as the treatment of humans and animals (Goodarzi et al., 2013). The European Union recently has released a report concluding that about 25,000 patients die each year from infections caused by drug-resistant bacteria, which is equivalent to €1.5 billion of medical healthcare costs (Salim et al., 2013; Ziggers, 2011). Such data

***Corresponding Author:** Majdi. A.Kairalla *majdiabdelfaraj@yahoo.com* , Department of animal production-Faculty of Agriculture- University of sebha, Libya

indicates the seriousness of the problem throughout the globe and explains why many countries world-wide have banned antibiotic usage in livestock feeds.

Beneficial effects of dietary additives such as probiotics, prebiotics and organic acids, on the energy and protein utilization of poultry have been reported (Angel, Dalloul, & Doerr, 2005; Pirgozliev, Murphy, Owens, George, & McCann, 2008; Samarasinghe, Wenk, Silva, & Gunasekera, 2003; Yang et al., 2008). It has also been suggested that feed additives may be more efficient when low nutrient diets are fed. Generally, low density diets are more profitable and resulted in less environmental pollution problems. In recent years, the high price of protein sources as well as environmental concerns related to high nitrogen excretion have resulted in increasing interest for using low protein diets in poultry production (Torres-Rodriguez et al., 2005). Considering the positive effects of probiotics, prebiotics and organic acids on protein utilization, using low protein diets supplemented with these additives in broiler nutrition may be practical. In this regard, Angel et al. (2005) reported that feeding on low nutrient diets resulted in poorer performance, but dietary inclusion of probiotics helped the birds to overcome this negative effect by improving nutrient retention. Moreover, it has been reported that probiotics, prebiotics, and organic acids have positive effects on the immunity system (Huang et al., 2007; SA, El-Sanhoury, El-Mednay, & Abdel-Azeem, 2008; Zulkifli, Abdullah, Azrin, & Ho, 2000). However, there are only a few comparative reports on the effects of probiotics, prebiotics and organic acids on performance, immunity and the intestinal morphology of broilers fed on different levels of protein. Consequently, the current study was designed to investigate the response of broilers to diets supplemented with non-antibiotic growth promoters (probiotic (BioPlus 2B), prebiotic (TechnoMos), symbiotic, and medicinal herbs (Mixture of *Origanum majorana*, *Foeniculum vulgare* and *Carum carvi* in ratio 1:1:1), within two dietary protein levels (normal and low), on the Performance of Broilers.

MATERIALS AND METHODS

This study was conducted at Poultry Research Center, Faculty of Agriculture, Alexandria University. The experimental work was carried out at the broiler Production Unit, the current study was designed to investigate the response of broilers fed on test diets containing non-antibiotic growth promoters (probiotic (BioPlus 2B), prebiotic (TechnoMos), Synbiotic, and medicinal herbs (Mixture of *Origanum majorana*, *Foeniculum vulgare* and *Carum carvi* in ratio 1:1:1), within two dietary protein levels (normal and low), on broiler performance .

(Probiotic (BioPlus 2B) and prebiotic (TechnoMos) were purchased from the local market which were German originated products and imported within the same production season, and the medicinal herbs (Mixture of *Origanum majorana*, *Foeniculum vulgare* and *Carum carvi* in ratio 1:1:1) was purchased from the local market, and a sample was utilized for further chemical evaluation.

Additives (probiotic, prebiotic and Herbs).
All additives were commercial products in powder form and added to the diets according to the levels recommended by the manufacturers. Additives and their dosages were:

Probiotic (BioPlus 2B):
Mixture of *Bacillus licheniformis* spores and *Bacillus subitlis* spores (DSM5750) in ratio 1:1, at 1g/kg of the starter and finisher diets.

Prebiotic, TechnoMos:
Biological active materials from the cell wall, fractions of *Saccharomyces cerevisiae* rich in 1,3 B-glucans and mannans 1000g, contains

Total Glucans	24%
B-glucans	20%
a-glucans and free glucans	4%
Total mannans:	18%

ISSN: online 2617-2186 print 2617-2178

Synbiotic: (Mixture of Probiotic and Prebiotic in ratio 1:1).
Herbs:
(Mixture of *Origanum majorana*, *Foeniculum vulgare* and *Carum carvi* in ratio 1:1:1).

Experimental diets

This experiment was designed in a 2 × 5 factorial arrangement with two levels of dietary crude protein (CP) and a four feed-additive programmer. The two levels of protein were the recommended: 230 and 200 g CP/kg for starter and finisher diets, respectively (Council, 1994), and low levels: 195 and 170 g CP/kg for starter and finisher diets, respectively. The feed-additive programmer was as follows:

1. The basal diet without any feed additive served as the control.

2. The basal diet supplemented with probiotic (1g/Kg).

3. The basal diet supplemented with prebiotic (1g/Kg).

4. The basal diet supplemented with probiotic and prebiotic (Synbiotic) (1g/Kg).

5. The basal diet supplemented with medicinal herb (1.5g/Kg).

The compositions of the experimental diets are presented in Table 1.

Table (1). Composition and Calculated Analysis of the basal Experimental Diets (g/kg).

Ingredients,%	Experimental diets			
	Starter 1 to 21 Day		Grower 21 to 42 day	
	Recommended Protein	Low Protein	Recommended Protein	Low Protein
Yellow Corn	552.00	660.00	600.00	706.00
Soybean Meal 44%	310.00	230.00	262.00	190.00
Corn Gluten Meal	80.00	60.00	80.00	50.00
Di-calcium phosphate	15.00	15.00	15.00	16.00
Lime stone	13.00	14.00	13.00	13.00
Salt (NaCl)	3.5	4.5	3.5	3.5
Veg. oil	20.00	10.00	20.00	15.00
L-lysine	0.00	1.52	0.20	2.00
DL-Methionine	1.58	2.00	1.95	2.25
Premix *	3.00	3.00	3.00	3.00
Total	1000	1000	1000	1000
Calculated analysis Crude Protein %	23.46	19.2	21.3	17.4
M.E. (kcal/ kg)	3149	3156	3285	3297
C/P	134	164	154	189
Fat	5.8	7.20	6.4	7.8
Crude Fiber, %	2.44	2.9	2.63	3.1
Calcium, %	1.02	1.07	0.98	1.03
Phosphorus	0.50	0.50	0.50	0.50
Methionine %	0.45	0.46	0.43	0.42
Lysine %	1.19	1.18	1.07	1.05

* premix each kg contain vit. A (12 M.I.U.), vit. D3 (3 U.I.U.), vit. E (10g), vit. K2 (1g), vit. B1 (1g), vit. B2 (5g), vit. B6 (1.5g), vit. B12 (10g), Pantathenic acid (10g), Nicotinic acid (20g), Folic acid (1000 mg), Biotin (100g), Choline chloride (500g), Copper (15g), Iodine (9g), Iron (35g), Manganese (66g), Zinc (66g), Selenium (30g).

ISSN: online 2617-2186 print 2617-2178

The 2 levels of CP were the (Council, 1994) - recommended level (23 % CP, for the starter and %21 grower diets, respectively) or the low level (19 % CP for the starter and %17 finisher diets, respectively).

The starter and grower diets in mash form were fed from 1 to 21 d and 22 to 42 d of age, respectively.

Statistical Analysis:
Data from all response variables were subjected to one analysis of variance applying SAS program (SAS, 2008) using General Linear Model (GLM). Significant differences among treatment means were separated using Duncan's multiple range procedure (Duncan, 1955) at 0.05, 0.01 and 0.001 probabilities.

The statistical model used was as follows:

$Yijk= \mu + Si + Jj+ (SJ)ij + eijkl$

Where:

Yijk= Observed value of the dependent variable.

μ = Overall mean.

Si = Effect of protein level.

Jj = Effect of feed additives inclusion.

(SJ)i j=Interaction between protein level and feed additives inclusion.

eijkl = The experimental random error.

RESULTS AND DISCUSSION

Performance traits:

Live Body Weight
The average live body weights of broilers throughout the six weeks experimental period as affected by different dietary additives under two levels of protein are presented in Table (2). It is clearly shown that no significant differences in body weight could be detected in initial body weight at day one of age. The interaction effect between the different additives and the two levels of protein started to show at two weeks of age with the probiotic and synbiotic treatments under the recommended level of protein having the highest body weights with a 5.1 and 2.6% increase compared to the control treatment under the recommended protein level ($p \leq 0.001$), respectively. Lowest live body weight was observed with the prebiotic treatment under the low level of protein with a reduction of 21.7% compared to the control treatment under the recommended level of protein and 7.5% compared to the control treatment under the low level of protein ($p\leq 0.001$). These effects were sustained to the end of the experimental period. At 6 weeks of age, the highest body weights were observed under the herb, synbiotic and probiotic treatments under the recommended level of protein with 4.9, 4.7 and 4.5% increases compared to the control treatment under the recommended level of protein, respectively ($p\leq 0.05$). At the end of the experiment period, the lowest body weight was observed with the probiotic treatment under the low level of protein with a reduction of 4.49% compared to the control treatment under the recommended level of protein, and 1.4% compared to the control treatment under the low level of protein ($p\leq 0.05$).

Effects of different levels of protein on live body weight regardless of feed additives are presented in Table (2). After only one week of treatment, the effect of low protein level was observed and sustained until the end of the experimental period. Low protein levels significantly reduced live body weight by 5.5, 19.4, 24, 39, 45.8 and 43.6% compared to the recommended protein treatment throughout the 6 weeks experimental period, respectively ($p\leq0.001$).

Effects of different feed additives on live body weight regardless of protein levels are presented in Table (2). Different feed additives effects

ISSN: online 2617-2186 print 2617-2178

started to show from the second week of age. By the end of the experimental period, different feed additives increased live body weight to reach 103, 102, 105 and 103% of control values with the probiotic, prebiotic, symbiotic, and herb treatments, respectively ($p \leq 0.05$).

(SM Kabir, 2009; Torres-Rodriguez et al., 2007) reported that administration of probiotic to turkeys increased the average daily gain and market body weight, representing an economic alternative to improve turkey production. However, (Aksu, Esenbuga, & Macit, 2006; SM Kabir, 2009) used *Saccharomyces cerevisiae* as a dietary probiotic to assess performance and found no overall weight gain difference. Probiotic is a generic term, and products can contain yeast cells, bacterial cultures, or both that stimulate microorganisms capable of modifying the gastrointestinal environment to favor health status and improve feed efficiency (Dierick, 1989; SM Kabir, 2009). Several studies reported that probiotics have beneficial effects on growth performance (Apata, 2008; Awad, Ghareeb, Abdel-Raheem, & Böhm, 2009; Dizaji, Hejazi, & Zakeri, 2012; SML Kabir, Rahman, Rahman, Rahman, & Ahmed, 2004; Khaksefidi & Ghoorchi, 2006; Kralik, Milaković, & Ivanković, 2004; Mountzouris et al., 2007; Sen et al., 2012; Shim et al., 2010; Solis de los Santos et al., 2005).

ISSN: online 2617-2186 print 2617-2178

Table (2). Effect of protein level and non- antibiotic feed additives and their interaction on body weight at different ages of broilers.

Protein level	Additives	Body weight d 1	Body weight d 7	Body weight d 14	Body weight d 21	Body weight d 28	Body weight d 35	Body weight d 42
				Interaction Effect				
Recommended	*Control*	40.36 ± 0.61	169.36 ± 2.28	438.20^{b} ± 7.47	838.28^{b} ± 8.54	1438.88^{b} ±14.06	2060.84^{ab} ± 36.66	2508.48^{c} ± 59.45
	Probiotic	40.32 ± 0.46	164.28 ± 2.18	460.68^{a} ± 6.77	880.24^{a} ± 12.70	1486.28^{a} ± 17.57	2066.80^{ab} ± 34.26	2621.12^{a} ± 28.03
	Prebiotic	40.40 ± 0.38	170.60 ± 2.60	444.84^{ab} ± 4.50	815.68^{b} ± 14.79	1411.44^{b} ± 13.13	2005.46^{b} ± 36.89	2556.58^{b} ± 29.22
	Synbiotic	40.32 ± 0.39	169.84 ± 2.37	449.64^{a} ± 8.16	856.28^{ab} ± 14.78	1474.80^{a} ± 17.32	2051.72^{ab} ± 22.81	2625.96^{a} ± 31.26
	Herb	40.84 ± 0.54	167.44 ± 2.96	443.80^{ab} ± 8.19	857.88^{ab} ± 12.53	1487.76^{a} ±16.59	2119.96^{a} ± 38.73	2630.52^{a} ± 40.63
Low	*Control*	40.72 ± 0.68	158.40 ± 1.29	371.08^{c} ± 6.69	662.32^{c} ± 6.14	924.00^{c} ± 13.40	1169.12^{c} ± 28.36	1445.28^{de} ± 39.96
	Probiotic	40.50 ± 0.57	159.62 ± 1.16	347.62^{de} ± 6.09	648.12^{cd} ± 12.2	877.83^{d} ± 14.03	1100.50^{d} ± 24.95	1425.46^{e} ± 63.23
	Prebiotic	40.48 ± 0.40	158.08 ± 1.60	343.32^{e} ± 5.18	641.80^{cd} ± 9.79	874.44^{d} ± 15.31	1104.68^{d} ± 26.13	1478.56^{d} ± 31.61
	Synbiotic	39.64 ± 0.52	161.16 ± 1.22	362.68^{d} ± 5.97	654.40^{cd} ± 8.70	880.00^{d} ± 17.00	1085.21^{e} ± 16.57	1493.08^{d} ± 34.05
	Herb	40.88 ± 0.52	157.6 ± 5.428	376.88^{c} ± 5.62	620.96^{d} ± 8.06	894.60^{d} ± 20.09	1121.28^{cd} ± 33.12	1456.32^{de} ± 46.75
				Main Effects of Protein Level				
Protein	*Recommended*	40.44 ± 0.21	168.30^{a} ± 1.11	447.43^{a} ± 3.21	849.67^{a} ± 5.98	1459.8^{a} ± 7.46	2061.40^{a} ± 15.44	2588.79^{a} ± 17.98
	Low	40.44 ± 0.24	158.98^{b} ± 1.20	360.41^{b} ± 2.86	645.50^{b} ± 4.22	890.27^{b} ± 7.31	1116.54^{b} ± 11.96	1459.75^{b} ± 19.63
				Main Effects of Feed Additives				
Additives	*Control*	40.54 ± 0.45	163.88 ± 1.52	404.64^{ab} ± 6.90	750.30^{abc} ± 13.60	1181.44^{a} ± 38.01	1614.98^{a} ± 67.70	1976.88^{b} ± 83.81
	Probiotic	40.40 ± 0.36	162.01 ± 1.28	405.30^{ab} ± 9.32	766.55^{a} ± 18.89	1188.27^{a} ± 45.30	1593.51^{ab} ± 72.84	2035.49^{ab} ± 92.63
	Prebiotic	40.44 ± 0.27	164.34 ± 1.76	394.08^{b} ± 8.00	728.74^{c} ± 15.21	1142.94^{b} ± 39.63	1545.88^{b} ± 68.68	2006.57^{ab} ± 80.65
	Synbiotic	39.98 ± 0.32	165.50 ± 1.45	406.16^{ab} ± 7.97	755.34^{ab} ± 16.73	1177.40^{a} ± 44.15	1578.33^{ab} ± 71.13	2071.08^{a} ± 84.87
	Herb	40.86 ± 0.37	162.56 ± 3.13	410.34^{a} ± 6.85	739.42^{bc} ± 18.46	1191.18^{a} ± 44.28	1620.62^{a} ± 75.66	2043.42^{ab} ± 89.29
				ANOVA				
S. O. V								
Pr × Add		NS	NS	***	*	*	*	*
Protein (Pr)		NS	***	***	***	***	***	***
Additives (Add)		NS	NS	*	*	*	*	*

a,b,c,.. Means with different superscripts in certain column for each effect at certain age are significantly different (P ≤ 0.05)

NS= Non- significant. (* P ≤0.05) (** P ≤0.01) (*** P ≤0.001).

ISSN: online 2617-2186 print 2617-2178

Live Body Weight Gain

The body weight gain of broilers throughout the six weeks experimental period as affected by different dietary additives under two levels of protein are presented in Table (3). There were no significant differences in body weight gain from day one till the first week of age. During the second week of age, the highest body weight gain was observed with the probiotic treatment under the recommended level of protein with an increase of 10.3% compared to the control treatment under the same level of protein ($p \leq 0.01$). Lowest body weight gain at the same age was observed with the prebiotic treatment under the low level of protein with a decrease of 31.1% compared to the control treatment under the recommended level of protein, and 12.9% compared to the control treatment under the low level of protein ($p \leq 0.01$). At 6 weeks of age, the highest body weight gain was observed under the synbiotic treatment under the recommended level of protein with 4.9% increase compared to the control treatment under the same level of protein, ($p \leq 0.05$). At the end of the experiment period, the lowest body weight gain was observed with the control treatment under the low level of protein with a reduction of 43% compared to the control treatment under the recommended level of protein ($p \leq 0.05$). Overall the whole experimental period, the highest body weight gain was observed with the herb treatment under the recommended level of protein, and the lowest with the probiotic treatment under the low level of protein ($p \leq 0.05$).

Effects of different levels of protein on body weight gain regardless of feed additives are presented in Table (3). After only one week of treatment, the effect of low protein level was observed and sustained to the end of the experimental period. Low protein level significantly reduced body weight gain to reach 93, 72.6, 70.5, 40, 37.7 and 69.2% of the recommended protein treatment values throughout the 6 weeks experimental period, respectively ($p \leq 0.001$). Over all the experimental period, the gain under the low level of protein was lower than the gain obtained with the recommended level of protein by 44% ($p \leq 0.001$).

Effects of different feed additives on body weight gain regardless of protein levels are presented in Table (3). Different feed additives did not show significant effects except at the end of experimental period. By 6 weeks of age, different feed additives increased body weight gain to reach 137, 127.5, 135.6 and 117% of control with the probiotic, prebiotic, symbiotic, and herb treatments, respectively ($p \leq 0.001$). Over the whole experimental period, the highest gain was obtained with the synbiotic treatment ($p \leq 0.01$).

ISSN: online 2617-2186 print 2617-2178

Table (3). Effect of protein level and non- antibiotic feed additives and their interaction on body weight gain at different ages of broiler

Protein	Additives	Body weight gain d 1-7	Body weight gain d 7-14	Body weight gain d 14-21	Body weight gain d 21-28	Body weight gain d 28-35	Bodyweight gain d 35-42	Body weight gain Over All
				Interaction Effect				
Recommended	*Control*	129.0 ± 2.22	268.84^{ab} ±7.65	400.08^{b} ± 9.18	600.60^{b} ±16.55	621.96^{a} ± 33.96	446.48^{c} ± 35.55	2468.12^{c} ± 59.60
	Probiotic	123.96 ± 2.40	296.40^{a} ± 7.13	419.56^{a} ± 11.49	606.04^{b} ± 24.08	580.52^{b} ± 32.03	554.32^{ab} ± 27.74	2580.80^{ab} ± 28.14
	Prebiotic	130.20 ± 2.64	274.24^{ab} ± 4.98	370.84^{c} ± 16.76	595.76^{b} ± 17.11	588.66^{b} ± 33.11	551.12^{ab} ± 34.15	2516.21^{b} ± 29.09
	Synbiotic	129.52 ± 2.20	279.80^{ab} ± 7.19	406.96^{b} ± 14.63	618.20^{a} ± 16.78	576.92^{b} ± 26.03	568.92^{a} ± 32.80	2585.64^{ab} ± 31.32
	Herb	126.60 ± 2.76	276.36^{ab} ± 8.07	414.08^{a} ± 14.18	629.88^{a} ± 19.81	632.16^{a} ± 41.84	510.56^{b} ± 23.62	2589.68^{a} ± 41.02
Low	*Control*	117.68 ± 1.42	212.68^{c} ± 6.74	291.24^{d} ± 10.70	261.68^{c} ± 13.69	245.12^{c} ± 20.38	276.16^{g} ± 29.40	1404.56^{e} ± 40.10
	Probiotic	121.70 ± 2.25	193.58^{d} ± 7.82	293.16^{d} ± 14.86	228.45^{d} ± 14.63	218.70^{d} ± 20.28	434.87^{c} ± 46.03	1389.01^{f} ± 59.82
	Prebiotic	117.60 ± 1.51	185.24^{d} ± 4.96	298.48^{d} ±12.56	232.64^{d} ± 17.17	230.24^{cd} ± 16.06	373.88^{e} ± 23.17	1438.08^{ed} ± 31.62
	Synbiotic	121.52 ± 1.30	201.52^{d} ± 6.08	291.72^{d} ±11.77	225.60^{d} ± 14.75	208.58^{e} ± 12.76	407.87^{d} ± 28.10	1453.50^{d} ± 33.89
	Herb	116.80 ± 5.47	219.20^{c} ±6.02	244.08^{e} ±10.83	273.64^{c} ±21.66	226.68^{d} ± 17.32	335.04^{f} ± 20.33	1415.44^{ed} ± 46.85
				Main Effects of Protein Level				
Protein	*Recommended*	127.85^{a} ± 1.10	279.12^{a} ± 3.22	402.30^{a} ± 6.13	610.09^{a} ± 8.47	600.13^{a} ± 15.0	526.08^{a} ± 14.23	2548.35^{a} ± 18.03
	Low	119.04^{b} ± 1.27	202.51^{b} ± 3.01	283.66^{b} ± 5.66	244.53^{b} ± 7.54	226.06^{b} ± 7.82	364.65^{b} ± 14.32	1420.10^{b} ± 19.24
				Main Effects of Feed Additives				
Additives	*Control*	123.34 ± 1.53	240.76 ± 6.44	345.66 ± 10.44	431.14 ± 26.44	433.54 ± 33.29	361.32^{c} ± 25.87	1936.34^{b} ± 83.87
	Probiotic	122.85 ± 1.63	246.04 ± 9.07	357.65 ± 12.99	421.10 ± 30.66	403.30 ± 32.24	495.81^{a} ± 27.71	1997.06^{ab} ± 91.85
	Prebiotic	123.90 ± 1.75	229.74 ± 7.24	334.66 ± 11.58	414.20 ± 28.57	405.79 ± 31.49	460.69^{ab} ± 23.96	1966.14^{ab} ± 80.65
	Synbiotic	125.52 ± 1.39	240.66 ± 7.27	349.34 ± 12.41	421.90 ± 30.14	396.51 ± 30.28	490.04^{a} ± 24.39	2031.12^{a} ± 84.81
	Herb	121.70 ± 3.11	247.78 ± 6.44	329.08 ± 15.01	451.76 ± 29.30	429.42 ± 36.62	422.80^{b} ± 19.87	2002.56^{ab} ± 89.35
				ANOVA				
	S. O. V							
	Pr × Add	NS	**	**	*	*	*	*
	Protein (Pr)	***	***	***	***	***	***	***
	Additives (Add)	NS	NS	NS	NS	NS	***	*

ISSN: online 2617-2186 print 2617-2178

Feed Intake

The feed intake of broilers throughout the six weeks experimental period as affected by different dietary additives under two levels of protein are presented in Table (4). Effects of different additives under the two levels of protein fluctuated throughout the experimental period with the control group under the recommended protein level consuming highest amounts of food. By the end of the experimental period, the lowest feed was consumed by the herb treated group under the low level of protein representing 46% of feed consumed by the control group under the recommended level of protein, and 71% of feed consumed by the control group under the low level of protein ($p \leq 0.001$). Over all the experimental period, the highest amount of food was consumed by the control treatment under the recommended level of protein and the lowest by the probiotic treatment under the low level of protein ($p \leq 0.001$).

Effects of different levels of protein on feed intake regardless of feed additives are presented in Table (4). After only one week of treatment, the effect of low protein level was observed and sustained to the end of the experimental period. Low protein level significantly reduced feed intake to reach 83, 86, 87, 74, 58 and 58% of the recommended protein treatment values throughout the 6 weeks experimental period, respectively ($p \leq 0.001$). Over the whole experimental period, the low protein groups consumed 68% of the feed consumed by the recommended protein groups ($p \leq 0.001$).

Effects of different feed additives on feed intake regardless of protein levels are presented in Table (4). At the end of the experimental grower period (35-42 d), different feed additives of probiotic, prebiotic, symbiotic or herbs reduced the amount of feed intake to reach 94, 85, 85 and 85% of that of the control group, respectively. Over all the experimental period, the highest amount of feed was consumed by the control group and the lowest was by the probiotic groups.

The improvement in growth performance and feed efficiency of broiler chickens fed diet supplemented with different strains of probiotics (Awad et al., 2009; Awad, Ghareeb, & Böhm, 2010; SML Kabir et al., 2004; Mountzouris et al., 2007; Sen et al., 2012) are supposed to be induced by the cumulative effect of probiotic action including the improvement of feed intake and digestion (Shim et al., 2010), increased digestive enzyme activity and decreased ammonia production (Jin, Ho, Abdullah, & Jalaludin, 2000; Sen et al., 2012), maintenance of beneficial microbial population (Fuller, 1989), and alteration of bacterial metabolism (Jin et al., 2000; Sen et al., 2012).

ISSN: online 2617-2186 print 2617-2178

Table (4). Effect of protein level and non- antibiotic feed additives and their interaction on Feed intake of broiler at different ages of broiler

protein	Additives	Feed intake (g) d 1-7	Feed intake (g) d 7-14	Feed intake (g) d 14-21	Feed intake (g) d 21-28	Feed intake (g) d 28-35	Feed intake (g) d 35-42	Feed intake (g) 1-42d
Interaction Effect								
Recommended	*Control*	173^{a}	284	497^{a}	807^{a}	961^{a}	1072^{a}	3794.06^{a}
	Probiotic	170^{a}	270	466^{ab}	724^{bc}	857^{b}	1008^{b}	3494.08^{c}
	Prebiotic	174^{a}	271	471^{ab}	764^{b}	841^{b}	969^{c}	3472.40^{c}
	Synbiotic	172^{a}	268	468^{ab}	730^{bc}	869^{b}	967^{c}	3474.25^{c}
	Herb	160^{b}	264	459^{ab}	822^{a}	910^{ab}	1028^{b}	3644.11^{b}
Low	*Control*	142^{cd}	245	449^{b}	597^{c}	609^{c}	698^{d}	2740.10^{d}
	Probiotic	$158.^{b}$	237	410^{c}	539^{d}	482^{d}	646^{e}	2280.90^{g}
	Prebiotic	149^{c}	232	406^{c}	576^{cd}	504^{d}	543^{f}	2408.25^{e}
	Synbiotic	129^{d}	228	399^{c}	537^{d}	493^{d}	545^{f}	2330.10^{f}
	Herb	128^{d}	224	390^{c}	591^{c}	487^{d}	493^{f}	2313.25^{f}
SEM		1.7	0.8	1.6	2.7	3.8	6.4	8.7
Main Effects of Protein Level								
Protein	*Recommended*	170^{a}	271^{a}	472^{a}	769^{a}	887^{a}	1009^{a}	3575.68^{a}
	Low	141^{b}	233^{b}	410^{b}	568^{b}	515^{b}	584^{b}	2415.46^{b}
SEM		0.82	1.07	1.64	2.94	4.11	9.71	18.06
Main Effects of Feed Additives								
Additives	*Control*	157.500^{c}	264.500^{a}	473.000^{a}	702.000^{b}	785.000^{a}	885.000^{a}	3267.03^{a}
	Probiotic	164.183^{a}	253.959^{b}	438.448^{b}	633.571^{d}	673.734^{d}	830.877^{b}	2899.83^{c}
	Prebiotic	161.500^{b}	251.500^{cb}	438.500^{b}	670.000^{c}	672.500^{d}	751.653^{c}	2940.20^{cb}
	Synbiotic	150.500^{d}	248.000^{cd}	433.500^{c}	633.500^{d}	681.000^{c}	756.000^{c}	2902.05^{c}
	Herb	144.000^{e}	244.000^{d}	424.500^{d}	706.500^{a}	698.500^{b}	760.500^{c}	2978.50^{b}
SEM		2.21	3.11	4.56	14.41	26.67	34.13	85.69
ANOVA								
S. O. V								
Pr × Add		***	NS	***	***	***	***	***
Protein (Pr)		***	***	***	***	***	***	***
Additives (Add)		***	***	***	***	***	***	***

a,b,c,.. Means with different superscripts in certain column for each effect at certain age are significantly different ($P \leq 0.05$)
NS= Non- significant. (* $P \leq 0.05$) (** $P \leq 0.01$) (*** $P \leq 0.001$).

ISSN: online 2617-2186 print 2617-2178

4. Feed conversion ratio

The feed conversion ratio of broilers throughout the six weeks experimental period as affected by different dietary additives under two levels of protein are presented in Table (5). By the end of the experiment period, synbiotic treatment showed the best feed conversion ratio under both protein levels ($p \leq 0.05$), whereas the worst was attributed to the low protein control treatment followed by the normal protein control treatment. It was noticed that different treatment improving effect was more profound under the low protein diet compared to their effect under the recommended protein diet. Feed conversion ratio under the recommended protein level improved by 28, 26, 30 and 21% and by 49, 48, 53, and 47% under the low protein diet with the probiotic, prebiotic, synbiotic and herb treatments, respectively. This comes in good agreement with previous findings, in general, these additives have proved to be most effective under conditions of stress, possibly the presence of unfavorable organisms, extremes in ambient temperature, diseases, crowding and poor management (Midilli et al., 2008) or in this case low protein diet. Over the whole experimental period, the worst feed conversion ratio was attributed to the low protein control and the best to the synbiotic treatment under the recommended protein level although without a significance.

Effects of different levels of protein on feed conversion ratio regardless of feed additives are presented in Table (5). During the six weeks experimental period, low protein groups had the worst feed conversion ratio compared to the recommended protein groups except for those at periods. Over the whole experimental period for groups fed on low protein diets, their feed conversion ratio was worse by 23% compared to those fed on recommended protein levels ($p \leq 0.001$).

Effects of different feed additives on feed conversion ratio regardless of protein levels are presented in Table (5). By 6 weeks of age, different feed additives improved feed conversion ratio by 39, 38, 42 and 35% compared to control with the probiotic, prebiotic, synbiotic and herb treatments, respectively ($p \leq 0.001$). Over all the experimental period, the synbiotic groups had the best feed conversion ratio.

As a feed additive, probiotics has a good impact on the poultry performance (Stavric and Kornegay, 1995; Rowghani, Arab, & Akbarian, 2007). Mechanisms by which probiotics improve feed conversion efficiency include alteration in intestinal flora, enhancement of growth of nonpathogenic facultative anaerobic and gram-positive bacteria forming lactic acid and hydrogen peroxide, suppression of growth of intestinal pathogens, and enhancement of digestion and utilization of nutrients (SM Kabir, 2009). Therefore, the major outcomes from using probiotics include improvement in growth, reduction in mortality (SM Kabir, 2009; Kumprecht & Zobac, 1998), and improvement in feed conversion efficiency, which are consistent with the findings of Tortuero and Fernandez (Tortuero & Fernandez, 1995) who observed an improvement in feed conversion efficiency as supplemented diet with probiotic with the supplementation of probiotic to the diet (SM Kabir, 2009).

ISSN: online 2617-2186 print 2617-2178

Table (5). Effect of protein level and non- antibiotic feed additives and their interaction on Feed conversion ratio at different ages.

protein	Additives	Feed conversion (g) d 1-7	Feed conversion (g) d 7-14	Feed conversion (g) d 14-21	Feed conversion (g) d 21-28	Feed conversion (g) d 28-35	Feed conversion (g) d 35-42	Feed conversion (g) Over All
				Interaction Effect				
Recommended	*Control*	1.34 ± 0.02	1.08 ±0.03	1.25^{cd} ± 0.02	1.36^{c} ± 0.03	1.68^{c} ± 0.11	2.70^{b} ± 0.19	1.55 ± 0.03
	Probiotic	1.38 ± 0.02	0.92 ± 0.02	1.13^{e} ± 0.03	1.25^{c} ± 0.07	1.77^{c} ± 0.28	1.92^{d} ± 0.09	1.35 ± 0.01
	Prebiotic	1.35 ± 0.02	0.99 ± 0.01	1.34^{c} ± 0.07	1.30^{c} ± 0.03	1.52^{d} ± 0.08	1.99^{cd} ± 0.18	1.39 ± 0.01
	Synbiotic	1.33 ± 0.02	0.97 ± 0.02	1.20^{d} ± 0.06	1.20^{c} ± 0.03	1.59^{d} ± 0.08	1.90^{d} ± 0.17	1.34 ± 0.01
	Herb	1.28 ± 0.02	0.97 ± 0.03	1.13^{e} ± 0.03	1.33^{c} ± 0.04	1.67^{c} ± 0.16	2.13^{c} ± 0.11	1.41 ± 0.02
Low	*Control*	1.20 ± 0.01	1.18 ± 0.04	1.59^{a} ± 0.06	2.41^{b} ± 0.11	3.05^{a} ± 0.32	3.13^{a} ± 0.26	1.98 ± 0.03
	Probiotic	1.29 ± 0.01	1.25 ± 0.04	1.55^{ab} ± 0.15	2.62^{ab} ± 0.19	2.56^{b} ± 0.22	1.59^{e} ± 0.10	1.67 ± 0.03
	Prebiotic	1.27 ± 0.01	1.27 ± 0.03	1.42^{b} ± 0.06	2.88^{a} ± 0.26	2.47^{b} ± 0.18	1.60^{e} ± 0.10	1.69 ± 0.03
	Synbiotic	1.06 ± 0.01	1.15 ± 0.03	1.41^{b} ± 0.05	2.62^{ab} ± 0.16	2.60^{b} ± 0.18	1.47^{e} ± 0.09	1.62 ± 0.03
	Herb	1.14 ± 0.04	1.04 ± 0.02	1.69^{a} ± 0.09	2.49^{b} ± 0.19	2.47^{b} ± 0.20	1.63^{e} ± 0.12	1.67 ± 0.04
				Main Effects of Protein Level				
Protein	*Recommended*	1.33^{a} ± 0.01	0.99^{b} ± 0.01	1.21^{b} ± 0.02	1.29^{b} ± 0.02	1.65^{b} ± 0.07	2.13^{a} ± 0.07	1.41^{b} ± 0.01
	Low	1.19^{b} ± 0.01	1.18^{a} ± 0.01	1.53^{a} ± 0.04	2.60^{a} ± 0.08	2.63^{a} ± 0.10	1.89^{b} ± 0.08	1.73^{a} ± 0.02
				Main Effects of Feed Additives				
Additives	*Control*	1.27^{b} ± 0.01	1.13^{ab} ± 0.02	1.42 ± 0.04	1.89 ± 0.09	2.37 ± 0.19	2.91^{a} ± 0.16	1.77^{a} ± 0.04
	Probiotic	1.34^{a} ± 0.01	1.08^{ab} ± 0.03	1.33 ± 0.08	1.92 ± 0.14	2.16 ± 0.18	1.76^{b} ± 0.07	1.51^{b} ± 0.02
	Prebiotic	1.31^{ab} ± 0.01	1.13^{a} ± 0.02	1.38 ± 0.04	2.09 ± 0.17	2.00 ± 0.12	1.79^{b} ± 0.10	1.54^{b} ± 0.02
	Synbiotic	1.20^{c} ± 0.02	1.06^{bc} ± 0.02	1.30 ± 0.04	1.91 ± 0.13	2.09 ± 0.12	1.69^{b} ± 0.10	1.48^{b} ± 0.02
	Herb	1.21^{c} ± 0.02	1.00^{c} ± 0.02	1.41 ± 0.06	1.91 ± 0.12	2.07 ± 0.14	1.88^{b} ± 0.08	1.54^{b} ± 0.03
				ANOVA				
	S. O. V							
	Pr × Add	NS	NS	*	*	*	*	NS
	Protein (Pr)	***	***	***	***	***	*	***
	Additives (Add)	***	***	NS	NS	NS	***	***

a,b,c,.. Means with different superscripts in certain column for each effect at certain age are significantly different ($P \leq 0.05$)

NS= Non- significant. (* $P \leq 0.05$) (** $P \leq 0.01$) (*** $P \leq 0.001$.)

ISSN: online 2617-2186 print 2617-2178

CONCLUSION

There is a worldwide attempt to reduce antibiotic use in animal production as it cause an increase in microbial resistance to antibiotics, and also residues in animal products can be harmful to consumers (Jin, Ho, Abdullah, & Jalaludin, 1998; Wang & Gu, 2010). Therefore, the need for alternative techniques for poultry production is increasing and the contribution of probiotics may be considerable (Patterson & Burkholder, 2003; Wang & Gu, 2010).

Based on the gained results, it can be concluded that the addition of synbiotic in broilers chicken diet has a significant influence on productive performance and the final body weight. It could be concluded, under conditions of the current study, that synbiotic showed significant effects on the performance of broiler chickens. Further research is still in need to verify current results.

REFERENCES

Aksu, M., Esenbuga, N., & Macit, M. (2006). pH and colour characteristics of carcasses of broilers fed with dietary probiotics and slaughtered at different ages. *Asian-australasian journal of animal sciences, 19*(4), 605-610 .

Angel, R., Dalloul, R., & Doerr, J. (2005). Performance of broiler chickens fed diets supplemented with a direct-fed microbial. *Poultry science, 84*(8), 1222-1231 .

Apata, D. (2008). Growth performance, nutrient digestibility and immune response of broiler chicks fed diets supplemented with a culture of Lactobacillus bulgaricus. *Journal of the Science of Food and Agriculture, 88*(7), 1253-1258 .

Awad, W., Ghareeb, K., Abdel-Raheem, S., & Böhm, J. (2009). Effects of dietary inclusion of probiotic and synbiotic on growth performance, organ weights, and intestinal histomorphology of broiler chickens. *Poultry science, 88*(1), 49-56 .

Awad, W., Ghareeb, K., & Böhm, J. (2010). Effect of addition of a probiotic micro-organism to broiler diet on intestinal mucosal architecture and electrophysiological parameters. *Journal of animal physiology and animal nutrition, 94*(4), 486-494 .

Barton, M. D. (2000). Antibiotic use in animal feed and its impact on human healt. *Nutrition research reviews, 13*(2), 279-299 .

Council, N. R. (1994). Nutritional requirements of poultry: National Academy Press, Washington, DC.

Dierick, N. (1989). Biotechnology aids to improve feed and feed digestion: enzymes and fermentation. *Archives of Animal Nutrition, 39*(3), 241-261 .

Dizaji, B. R., Hejazi, S., & Zakeri, A. (2012 .(Effects of dietary supplementations of prebiotics, probiotics, synbiotics and acidifiers on growth performance and organs weights of broiler chicken. *Eur. J. Exp. Biol, 2*(6), 2125-2129 .

Duncan, D. (1955). Multiple Ranges and Multiple F. test Biometrics .*Statistical Methods* .

Fuller, R. (1989). Probiotic in man and animals. *J. Appl. Bacteriol., 66*, 131-139 .

Goodarzi, M., Landy, N., & Nanekarani, S. (2013). Effect of onion (Allium cepa L.) as an antibiotic growth promoter substitution on performance, immune responses and serum biochemical

ISSN: online 2617-2186 print 2617-2178

parameters in broiler chicks. *Health, 5*(08), 1210 .

Hinton, M., Kaukas, A., & Linton, A. (1986). *The ecology of drug resistance in enteric bacteria.* Paper presented at the Society for Applied Bacteriology symposium series.

Huang, R. L., Deng, Z. Y., Yang, C. b., Yin, Y. L., Xie, M. Y., Wu, G. Y., . . . Kang, P. (2007). Dietary oligochitosan supplementation enhances immune status of broilers. *Journal of the Science of Food and Agriculture, 87*(1), 153-159 .

Jin, L., Ho ،Y., Abdullah, N., & Jalaludin, S. (1998). Growth performance, intestinal microbial populations, and serum cholesterol of broilers fed diets containing Lactobacillus cultures. *Poultry science, 77*(9), 1259-1265 .

Jin, L., Ho, Y., Abdullah, N., & Jalaludin ،S. (2000). Digestive and bacterial enzyme activities in broilers fed diets supplemented with Lactobacillus cultures. *Poultry science, 79*(6), 886-891 .

Kabir, S. (2009). The role of probiotics in the poultry industry. *International Journal of Molecular Sciences, 10*(8), 3531-3546 .

Kabir, S., Rahman, M. M., Rahman, M., Rahman, M., & Ahmed, S. (2004). The dynamics of probiotics on growth performance and immune response in broilers. *Int. J. Poult. Sci, 3*(5), 361-364 .

Khaksefidi, A., & Ghoorchi, T. (2006). Effect of probiotic on performance and immunocompetence in broiler chicks. *The Journal of Poultry Science, 43*(3), 296-300 .

Kralik, G., Milaković, Z., & Ivanković, S. (2004). Effect of probiotic supplementation on the performance and the composition of the intestinal microflora in broilers. *Acta Agraria Kaposvariensis, 8*(2), 23-31 .

Kumprecht, I., & Zobac, P. (1998). The effect of probiotic preparations containing Saccharomyces cerevisae and Enterococcus faecium in diets with different levels of beta-vitamins on chicken broiler performance. *Czech Journal of Animal Science-UZPI (Czech Republic* .(

Midilli, M., Alp, M., Kocabach, N., Muglah, O., Turan, N., Yilmaz, H., & Cakir, S. (2008). Effects of dietary probiotic and prebiotic supplementation on growth performance and serum IgG concentration of broilers. *South African journal of animal science, 38*(1), 21-27 .

Mountzouris, K., Tsirtsikos, P., Kalamara, E., Nitsch, S., Schatzmayr, G., & Fegeros, K. (2007). Evaluation of the efficacy of a probiotic containing Lactobacillus, Bifidobacterium, Enterococcus, and Pediococcus strains in promoting broiler performance and modulating cecal microflora composition and metabolic activities. *Poultry science, 86*(2), 309-317 .

Patterson, J., & Burkholder, K. (2003). Application of prebiotics and probiotics in poultry production. *Poultry science, 82*(4), 627-631 .

Pirgozliev, V., Murphy, T., Owens, B., George, J., & McCann, M. (2008). Fumaric and sorbic acid as additives in broiler feed. *Research in veterinary science, 84*(3 ،(.394-387

Rowghani, E., Arab, M., & Akbarian, A. (2007). Effects of a probiotic and other

ISSN: online 2617-2186 print 2617-2178

feed additives on performance and immune response of broiler chicks. *International journal of poultry science, 6*(4), 261-265 .

SA, A.-F., El-Sanhoury, M., El-Mednay ،N., & Abdel-Azeem, F. (2008). Thyroid activity, some blood constituents, organs morphology and performance of broiler chicks fed supplemental organic acids. *International journal of poultry science, 7*(3), 215-222 .

Salim, H., Kang, H., Akter, N., Kim, D ،.Kim, J., Kim, M., . . . Suh, O. (2013). Supplementation of direct-fed microbials as an alternative to antibiotic on growth performance, immune response, cecal microbial population, and ileal morphology of broiler chickens. *Poultry science, 92*(8), 2084-2 .090

Samarasinghe, K., Wenk, C., Silva, K., & Gunasekera, J. (2003). Turmeric (Curcuma longa) root powder and mannanoligosaccharides as alternatives to antibiotics in broiler chicken diets. *ASIAN AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, 16*(10), 1495-1500 .

SAS. (2008). (Statistical Analysis System, 2008) program version 9.2.

Sen, S., Ingale, S., Kim, Y., Kim, J., Kim, K., Lohakare, J., . . . Kwon, I. (2012). Effect of supplementation of Bacillus subtilis LS 1-2 to broiler diets on growth performance, nutrient retention, caecal microbiology and small intestinal morphology *.Research in veterinary science, 93*(1), 264-268 .

Shim, Y., Shinde, P., Choi, J., Kim, J., Seo, D., Pak, J., . . . Kwon, I. (2010). 70 Evaluation of Multi-microbial Probiotics Produced by Submerged Liquid and Solid Substrate Fermentation Methods in Broilers. *Asian-australasian journal of animal sciences, 23*(4), 521 .

Stavric, S. and E.T. Kornegay., (1995). Microbial probiotic for pigs and poultry biotechnology in animal feeds and animals feeding. R.J. Wallace and A. Cheesen, Eds. V.C.H., Weinheim, Germany, pp: 205-231

Solis de los Santos, F., Farnell, M., Tellez, G., Balog, J., Anthony, N., Torres-Rodriguez, A., . . . Donoghue, A. (2005). Effect of prebiotic on gut development and ascites incidence of broilers reared in a hypoxic environment. *Poultry science, 84*(7), 1092-1100 .

Torres-Rodriguez, A., Donoghue, A., Donoghue, D., Barton, J., Tellez, G., & Hargis, B. (2007). Performance and condemnation rate analysis of commercial turkey flocks treated with a Lactobacillus spp.-based probiotic. *Poultry science, 86*(3), 444-446 .

Torres-Rodriguez, A., Sartor, C., Higgins, S., Wolfenden, A., Bielke, L., Pixley, C., . . . Hargis, B. (2005). Effect of Aspergillus meal prebiotic (fermacto) on performance of broiler chickens in the starter phase and fed low protein diets. *Journal of applied poultry research, 14*(4), 665-669 .

Tortuero, F., & Fernandez, E. (1995). Effects of inclusion of microbial cultures in barley-based diets fed to laying hens. *Animal Feed Science and Technology, 53*(3-4), 255-265 .

Wang, Y., & Gu, Q. (2010). Effect of probiotic on growth performance and digestive enzyme activity of Arbor Acres

ISSN: online 2617-2186 print 2617-2178

broilers. *Research in veterinary science, 89*(2), 163-167 .

Yang, Y., Iji, P., Kocher, A., Thomson, E., Mikkelsen, L., & Choct, M. (2008). Effects of mannanoligosaccharide in broiler chicken diets on growth performance, energy utilisation, nutrient digestibility and intestinal microflora. *British poultry science, 49*(2), 186-194 .

Ziggers, D. (2011). Animal Feed News. EU 12-point antibiotic action plan released, 18 November, 2011.

Zulkifli, I., Abdullah, N., Azrin, N. M., & Ho, Y. (2000). Growth performance and immune response of two commercial broiler strains fed diets containing Lactobacillus cultures and oxytetracycline under heat stress conditions. *British poultry science, 41*(5), 593-597 .

ISSN: online 2617-2186 print 2617-2178

تأثير البروبيوتيك، البريبيوتيك، السانبيوتيك والأعشاب الطبية على الأداء الإنتاجي لدجاج اللحم المتغذّي على نسب مختلفة من البروتين

مجدي عبد الفراج خير الله [1*]، عبد الحكيم عامر أبوراس[2] وكريميان عزيز عمر [3]

[1] قسم الإنتاج الحيواني–كلية الزراعة – جامعة سبها

[2] قسم الإنتاج الحيواني –كلية الزراعة – جامعة الجبل الغربي

[3] قسم إنتاج الدواجن –كلية الزراعة – جامعة الإسكندرية

تاريخ الاستلام: 20 سبتمبر 2018 / تاريخ القبول: 6 ديسمبر 2018

Doi:https://doi.org/10.54172/mjsc.v33i4.298

المستخلص: الهدف من هذه الدراسة كان لمعرفة مدى تأثير منشطات النمو الطبيعية، بروبيوتيك (BioPlus 2B)، بريبيوتيك (TechnoMos)، سانبيوتيك ومخلوط الأعشاب الطبيعية (مكونة من الشمر والبردقوش والكراوية بنسب خلط (1: 1: 1) مع مستويين مختلفين من البروتين (مثالي ومنخفض) على الأداء الإنتاجي لدجاج اللحم. أجريت هذه الدراسة بمركز بحوث الدواجن – كلية الزراعة–جامعة الإسكندرية – مصر. استمرت التجربة لمدة 42 يوماً. تم توزيع عدد 500 كتكوت لحم عمر يوم من سلالة كوب ووزعت الطيور عشوائيا على 10 مجاميع تجريبية بكل مجموعة خمس مكررات وبكل مكررة 10 كتاكيت. تم تجهيز عشرة تركيبات علفية (بادي ونامي) لتغطية جميع متطلبات المواد الغذائية لكتاكيت اللحم خلال مرحلتي النمو البادي (1 – 21) يوماً والنامي (22 – 42) يوماً من العمر. تتألف التركيبات العلفية من مستويين من البروتين الخام الموصي به والمنخفض (85% من الموصي به) وخمسة إضافات غذائية هي البروبايوتيك، البريبايوتيك، السنبيوتيك، مخلوط الأعشاب الطبية تم إضافتها للعليقة الكونترول لتشكل العلائق المختلفة. بشكل عام أدى انخفاض مستويات البروتين الخام لدجاج اللحم (–10٪ من NRC) إلى انخفاض أداء النمو، والذي تم تعويضه جزئيًا بمنشطات النمو الطبيعية ومن بين الإضافات، كان لـ synbiotic تأثيرات مهمة بشكل إيجابي على الوزن الحي ومعامل التحويل الغذائي.

الكلمات المفتاحية: بروبيوتيك، بريبيوتيك، سانبيوتيك، الأعشاب الطبية، الأداء الإنتاجي، دجاج اللحم، البروتين.

*مجدي عبد الفراج خيرالله majdiabdelfaraj@yahoo.com قسم الانتاج الحيواني– كلية الزراعة – جامعة سبها.