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EFFECT OF ENZYME PREPARATION AND SOME BIOLOGICAL GROWTH PROMOTERS ON PERFORMANCE OF BROILERS FED CORN-SOYBEAN MEAL BASED DIETS

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ABSTARCT

An experiment was conducted to compare the effect of supplementing multi-enzyme preparation *Phytabex-Plus* (200 g/ ton), or some biological growth promoters [*Amio-Flash* (2 Kg/ ton) and *Bio-Strong* (150 g/ ton)] or new natural growth promoter [*Bio-Feed* (1 Kg/ ton)] to starter and grower diets on growth performance, carcass traits and some blood plasma constituents as well as economic efficiency during growth period (0-5 wks of age). A total of 150 unsexed one day-old Cobb broiler chicks were distributed equally into 5 dietary treatments in 3 replicates of 10 birds each. Feed and water were supplied *ad-libitum* till the end of the experiment at 5 weeks. At the end of experiment, 3 birds from each treatment were randomly slaughtered for blood plasma constituents analysis and carcass measurements. The results indicated that live body weight, body weight gain, feed consumption, feed conversion ratio and performance index were significantly affected by growth promoters or enzyme preparation supplementation during the overall experimental period (0-5 wks of age). Chicks fed diets supplemented with *Amio-Flash* recorded the best values of the previous traits than those fed other dietary treatments.

Carcass traits indicated that different growth promoters or enzyme preparation had no effects on carcass characteristics. Plasma total protein, Albumin, globulin and cholesterol were significantly increased while,, AST and ALT were significantly decreased by adding *Amio-Flash* to the diets as compared to the control. Feeding economical efficiency was improved for broiler chicks by feeding diets supplemented with *Amio-Flash* or enzyme preparation than the control. These results indicated that supplementing *Amio-Flash* as a growth promoter or *Phytabex-Plus* as an enzyme product to broiler diets could be used to maximize growth performance as well as economic efficiency during growth period (0-5 wks of age).

Keywords: broiler, performance, *Phytabex-Plus*, *Amio-Flash*, *Bio-Feed* and *Bio-Strong*

INTRODUCTION

The ban of using antibiotics as therapeutic in Europe on January 2006 and the potential for a ban in the United States lead to increase the interest to find antibiotic alternatives in the poultry industry. A great deal of attention has recently been received from nutritionists and veterinary experts for reducing enteric diseases, proper utilization of nutrients and the use of pro-biotics, pre-biotics; synbiotics and herbs extracts for growth promotion of poultry. (Piray *et al*., 2007). Growth promoters are chemical and biological substances which are added to poultry diets with the aim to improve the growth of chickens in fattening, improve the utilization of food and in this way realize, better production and financial results (Peric *et al*., 2009). Improvement in growth performance and feed efficiency of broiler chickens fed pro-biotics (Mountzouris *et al*., 2007 and Samli *et al*., 2007) is thought to be induced by

the total effects of pro-biotics action including the maintenance of beneficial microbial population (Fuller, 1989), improving feed intake and digestion (Nahashon, *et al*., 1992 and 1993) and altering bacterial metabolism (Cole, *et al*., 1987 and Jin *et al*., 2000). These authers stated that, inclusion of the adherent lactobacillus cultures to chicken, either as single strain of lactobacillus acidophilus or as mixture of 12 lactobacillus strains, significantly increased the body weight of broilers after 40 days of feeding(Jin, *et al*., 2000). On the other hand, Zhang *et al*. (2005) concluded that feeding broilers chicks on diet containing yeast components, Saccharomyces cerevisiae such as whole yeast or cell wall improved growth performance of broiler fed 1.0 Kg Primalac or 0.5 Kg Bioaction/ ton diets. Pro-biotic had the highest averages of body weight at the 4^{th} and 7^{th} weeks of age, when compared with control group (Eglal, 2006). Recently, Toghyani *et al*. (2011) reported that, diet supplemented with pro-biotic or pre-biotic increased body weight of broilers at 28 and 42 days of age. On the contrary, many studies have been reported that supplementation of pro-biotics or pre-biotics has no positive effect on nutrient digestibility and broiler chicks performance (Panda *et al*., 2000; Ahmed, 2004 and Rodriguez *et al*., 2012). Therefore dietary supplementation of pro-biotic (Bio-plus) or pre-biotic (Bio-MOS) did not significantly affect broiler performance (Midilli *et al*., 2008). In addition there is a tendency to use herbs and herbs extracts as natural feed additives to avoid the residual cumulative effect for either antibiotics or synthetic drugs in final products of poultry, which has a negative effect on the human health (Hashemi *et al*., 2008 and Al-Kirshi *et al*., 2010). In this respect, several investigators reported that supplementation of dietary herbs or herbs extracts stimulate the growth performance of poultry (Bampidis *et al*., 2005, Griggs and Jacob 2005 and Cross *et al.,* (2007). Similarly, Nematallah *et al*. (2014) recorded to use of Anise, Fennel seeds and *Bio-Strong* (as a natural commercial feed additive) in broiler diets to improve production performance and immunity without adverse effect on carcass characteristics or blood parameters. The new trend in poultry production is the addition of exogenous enzymes to broiler chicken feeds because of both economic and environmental aspects. It is well known that exogenous enzymes have been used to improve the productivity and digestibility of corn and soybean meal diets which induce less viscosity for broilers (Cowieson and Ravindran, 2008). Moreover, several reports indicated that dietary enzymes improve productivity and immunity of broilers (Safaa, 2013), feed efficiency and digestibility of fat and protein (Freitas *et al.,* 2011) and amino acids (Angel *et al.,* 2011). Since, enzyme preparations, pro-biotics, pre-biotics, and extracts of medicinal plants herbs are preferable as feed additives and growth promoters.

So, the goal of the present study was to investigate the impact response due to enzyme preparation (*Phytabex-Plus*) or microbial pro-biotics such as (*Amio-Flash* and *Bio-Feed*) or due to plant-derived phytogenic (*Bio-Strong*) supplementation as growth promoters on the productive performance and some physiological traits of broiler chicks.

MATERIALS AND METHODS

This Study was conducted at poultry experimental unit, Agricultural Experimental and Research Station at Shalkan, Faculty of Agriculture, Ain Shams University, Egypt.

Dietary growth promoters

Four kinds of dietary feed additives were used (*Phytabex-Plus , Amio-Flash*, *Bio-Feed* and *Bio-Strong*). *Phytabex-Plus* is a dry stabilized degrading enzyme preparation manufactured by ENBIO-TECH Co., LTD, China which represents multi-enzyme preparation, each 1 Kg contains (Xylanase 10,000,000 IU, Cellulase 500,000 IU, β-Glucanase 500,000 IU, β-Mannanase 800,000 IU, Phytase 5,500,000 FTU, Acid Protease 2,000,000 IU, α-Amylase 100,000).and corn starch food grade (carrier) up to 1 Kg. *Amio-Flash* is a commercial product, manufactured by IBEX INT., LTD. Company, Egypt. It consists of live *Lactobacillus* bacteria, *Aspergillus oryzae* and *Torellolisis Aotis* yeast with Fructo-oligo-saccharides, and other ingredients such as mannan-oligo-sachharide with Beta-gluccan, amino acids (methionine + lysine) and some vitamins, Betaine and L-carnetine.

Additionally, *Bio-Feed* is a new pro-biotic microbial product, which is dry and stabilized preparation manufactured by (Microbiological laboratory, MERCIN, Faculty of Agriculture, Ain Shams University). It is a culture of fungi and dry yeast (*Bacillus subtilis*, 10^6/ g, *Enterococcus faecium*, 10^6/ g, *Aspergillus oryzae*, 10^5/ g and *Trichoderma longibrachiatum*, 10^5/ g) with a carrier of *Saccharomyces cerevisiae* up to 1 Kg. The last one is *Bio-Strong* which is a plant derived, phytogenic feed additive for poultry. The active ingredients of *Bio-Strong* are essential oils, bitter substances, pungent substances and saponins derived from herbs, spices and their extracts.

Experimental design

A total number of 150 unsexed one-day-old age cobb chicks were used and randomly allocated to five dietary treatments groups. Each treatment group contained 30 chicks which were allotted into 3 replicates of 10 chicks each. The first group of chicks was considered as a control group and fed the basal diet without supplementation of any growth prompters (T1), While the other four groups were fed on the basal diet supplemented with *Amio-Flash* (2.0 Kg/ton) T2, *Bio-Feed* (1.0 Kg/ ton) T3, *Bio-Strong* (150 g/Ton) T4 and *Phytabex-Plus* (200 g/ ton) during the growth period (Table, 1). Basal starter (0-3 weeks) and grower (4-5 weeks) diets were formulated, their composition and calculated analyses are shown in Table (2). Chicks of all treatments were reared under similar hygienic and managerial conditions. They were housed in well ventilated brooding pens and feed and water were provided *ad-libitum* throughout the experimental period.

Data collection

Live body weight (LBW) and feed consumption (FC) for each replicate for all treatments were recorded, then averaged throughout the experimental periods. Daily weight gain, daily feed consumption and feed conversion ratio (FCR) were also calculated during the same periods. Feeding economical efficiency (EE) was recorded according to the prices of feed ingredients,

additives and live body weight prevailing during experimental time. Performance Index and production efficiency factor were calculated according to North (1981) and Emmert (2000).

Slaughtering and blood samples

At the end of 5wks of age, chickens were individually weighted in each group. Three chickens from each treatment were randomly slaughtered. During slaughter, individual blood samples were taken from birds within each treatment and collected into dry clean centrifuge tubes with heparin and centrifuged for 15 minutes (3000 r.p.m.). Plasma were stored frozen at -20C until use. Then, total protein, albumin, total cholesterol and transaminase enzymes activity (AST and ALT) were determined by commercial Kits (produced by Bio-Diagnostics company, Egypt). After scalding and evisceration, different organs and abdominal fat were dissected and weighed. Edible organs including heart, empty gizzard and liver were weighed. Eviscerated carcass and organs weight percentages were calculated on the basis of LBW.

Statistical analysis

Data obtained were statistically analyzed using the General Linear Model (GLM) procedure of SAS (2004). Means were compared using Duncan's Multiple Range test (Duncan, 1955) where the level of significance was set at ($P < 0.05$) level.

The statistical model was: $Yij= M +Ti+ eij$

Where:

Yij = An observation — M =overall mean

Ti = Effect of treatment — Eij = random error.

RESULTS AND DISCUSSION

Productive performance:

The live body weight and daily weight gain of broiler chicks as affected by dietary treatments are illustrated in Table (3). It is worth to note that the chicks fed *Amio-Flash* (T2) diets during growing periods (0-3, 4-5 and 0-5 weeks) reflected the highest significant ($P<0.05$) results in both live body weight and daily weight gain compared with the other treatments. However, during starter period (0-3 wks) chicks increased by 10.3% (669.50 versus 738.66 g) compared with the control group (T1). On the other hand, chicks fed *Bio-Feed* diet (T3), *Bio-Strong* diet (T4) or *Phytabex-Plus* (T5) gave slightly higher live body weight (685, 683 and 714 g) respectively, compared to those fed control diet, in most cases differences within treatments were statistically not significant. During overall experimental period (0-5 wks), chicks fed (T2) diet were significantly ($P<0.05$) heavier than control (T1) and the relative increment in LBW was 137.06 g (9.9%) as shown in Table (3). However the increment in daily weight gain (DWG) due to the effect of growth promoter *Amio-Flash* was more pronounced during starting rather than growing period. Responses of chicks fed diets supplemented with *Bio-Feed* (T3), *Bio-Strong* (T4) or *Phytabex-Plus* (T5) showed that chicks fed (T5) diet supported the highest LBW and DWG than those fed (T3 , T4) or control

diets. The corresponding figures were 1453.13, 1391.5, 1385.0 and 1383.83 g, respectively and the differences were insignificant.

Table (1): Prices and feed additives of experimental diets.

Ingredients	Dietary Treatments				
	1	2	3	4	5
	Starter (0-21 days)				
Additives	-	*Amio-Flash* 2.0 Kg/ Ton	*Bio-Feed* 1.0 Kg/ Ton	*Bio-Strong* 150 g/ Ton	*Phytabex-Plus* 200 g/ Ton
Price/ Ton (L.E.)	3827	3917	3852	3907	3867
	Grower (21-35 days)				
Additives	-	*Amio-Flash* 2.0 Kg/ Ton	*Bio-Feed* 1.0 Kg/ Ton	*Bio-Strong* 150 g/ Ton	*Phytabex-Plus* 200 g/ Ton
Price/ Ton (L.E.)	3808	3898	3833	3888	3848

Table (2): Feed ingredients and chemical composition of basal diets.

Ingredients	Dietary Treatments	
	Starter (0-3 Weeks)	Grower (4-5 Weeks)
Corn (grains)	54.50	57.50
Soybean meal (44%)	33.00	28.00
Corn Gluten meal (62%)	6.20	6.20
Soybean oil	2.00	4.00
Mono-calcium phosphate	1.80	1.80
Calcium carbonate	1.60	1.60
Premix*	0.30	0.30
Salt	0.20	0.20
Methionine HA	0.20	0.20
HCL Lysine	0.20	0.20
Total	100	100
Chemical composition		
Crude protein %	23.00	21.05
ME Kcal/ Kg diet	2986	3168
Ca%	1.02	1.00
AP%	0.50	0.49
Lysine	1.29	1.16
Methionine + Cystein %	0.95	0.90
Price/ Ton (L.E.)	3827	3808

Methionine HA: Methionine Hydroxy-Analogue, ME: metabolizable energy, AP: Available phosphorus.

*** Each 3 Kg of the premix contains: Vitamins: A: 12000000 IU; Vit. D3 2000000 IU; E: 10000 mg; K3: 2000 mg; B1:1000 mg; B2: 5000 mg; B6:1500 mg; B12: 10 mg; Biotin: 50 mg; Coline chloride: 250000 mg; Pantothenic acid: 10000 mg; Nicotinic acid: 30000 mg; Folic acid: 1000 mg; Minerals: Mn: 60000 mg; Zn: 50000 mg; Fe: 30000 mg; Cu: 10000 mg; I: 1000 mg; Se: 100 mg and Co: 100 mg**

It was obvious from Table (3), that the DWG (g/ d) during the experimental period (0-5 wks) confirmed this trend and the corresponding values were 38.30, 42.21, 38.33, 38.52 and 40.28 g/ d when chicks were fed T1, T2, T3, T4 and T5 diets, respectively. Also, during starting period (0-3 wks) chicks fed diet containing *Amio-Flash* gained more daily weight and

gave the best figures than those fed control diet (29.81 versus 33.11) and the differences were statistically significant. However, during the growing period (4-5 wks), chicks fed (T2) diet gave slightly higher DWG (55.87 g/ d) compared to those fed control diet (51.02 g/ d), the differences were statistically significant. Similar observation was reported by Jin *et al.* (2000) and Fritts *et al*. (2000). They stated that, inclusion of the adherent lactobacillus cultures to chicken, significantly increased the body weight of broilers after 40 days of feeding. Also, it has been reported recently that poultry growth is promoted with increasing dose of pro-biotic from 0.5 or 1.5 grams per 10 Kg feed. The growth pattern of treated birds showed an increase in weight gain relative to the control, up to 1.0 g. per 10 Kg feed but beyond that the pattern was reveres (Ahmed, 2004).

Table (3): Effect of dietary treatments on productive performance.

Items	Dietary Treatments					
	1	2	3	4	5	Sig.
Live body weight (g)						
3 weeks	669.50^{c} ±2.59	738.66^{a} ±10.77	685.00^{c} ±1.34	683.00^{c} ±5.19	714.06^{b} ±0.96	**
5 weeks	1383.83^{b} ±15.68	1520.89^{a} ±30.66	1391.50^{b} ±28.00	1385.00^{b} ±16.16	1453.13^{b} ±1.80	**
Daily weight gain (g)						
0–3 weeks	29.81^{c} ±0.12	33.11^{a} ±0.51	30.56^{c} ±0.06	30.46^{c} ±0.24	31.94^{b} ±0.04	**
4–5 weeks	51.02^{b} ±0.93	55.87^{a} ±1.42	50.46^{b} ±2.09	50.14^{b} ±1.52	52.79^{ab} ±0.19	*
0–5 weeks	38.30^{b} ±0.45	42.21^{a} ±0.87	38.52^{b} ±0.80	38.33^{b} ±0.46	40.28^{b} ±0.05	**
Daily feed consumption (g)						
0–3 weeks	53.02^{b} ±0.29	55.92^{a} ±1.01	54.11^{b} ±0.15	53.58^{b} ±0.10	52.93^{b} ±0.75	*
4–5 weeks	111.97^{b} ±3.31	120.48^{a} ±0.12	110.37^{b} ±1.05	107.61^{b} ±0.77	119.74^{a} ±0.10	**
0–5 weeks	76.61^{b} ±1.50	81.75^{a} ±0.56	76.61^{b} ±0.32	75.19^{b} ±0.25	79.65^{a} ±0.08	**
Feed conversion ratio (g feed/ g gain)						
0–3 weeks	1.78^{a} ±0.02	1.69^{b} ±0.01	1.77^{a} ±0.01	1.76^{a} ±0.01	1.67^{b} ±0.04	*
4–5 weeks	2.19±0.10	2.16±0.05	٢.١٩±0.0٧	2.15±0.05	2.27±0.01	NS
0–5 weeks	2.00±0.06	1.93±0.02	1.99±0.03	1.96±0.01	1.98±0.01	NS

[a, b] Means within the same row with different superscripts are significantly different.
Sig. = Significance, ** (P≤0.01), * (P≤0.05). NS = Non Significant.

Data in Table (3) indicated that daily feed consumption (DFI) per bird (g/ d) was significantly (P<0.05) increased by feeding *Amio-Flash* diets (T2) compared with those fed control diet (T1). The increase in feed consumption was more pronounced during growing period (4-5 wks) being 7.6% while it was only 5.5% during the starting period (0-3 wks). On the other hand, chicks fed (T2) diet were more efficient in converting their feed into weight gain compared with those fed control diet (1.69 versus 1.78) and differences were significant (P<0.05). During starting period the addition of the *Bio-Feed* (T3)

or *Bio-Strong* (T4) to experimental diets led chicks to consume insignificantly more feed than control (T1) and FCR showed the same trend. It was obvious from (Table 3) that the effect of either *Bio-Feed* or *Bio-Strong* on feed consumption and feed conversion during growing period (4-5 wks) decreased and the differences were insignificant. The improvement of FCR may be due to the beneficial effects of pro-biotics supplementation which were improved digestibility of nutrients, reduced small intestine fermentation, increased caecal fermentation, reduced faecal output and increased digesta flow rate which effectively reduced the amount of available nutrients to the microflora (Ashayerizadeh *et al*., 2011; Sohail *et al*., 2002) while, El-Yamny and Fadel (2004) and O'Dea *et al*. (2006) reported that no significant differences in FRC between pro-biotics treatment and control group. In the same order, data in Table (3) indicate that daily feed consumption (g/ d) increased by feeding *Phytabex-Plus* (T5) compared to those fed control diet (T1) at grower or overall experimental periods. The corresponding figures were 119.75 versus 111.97 and 79.65 versus 76.61, respectively with significant differences. Figures of FCR indicated significant differences between chicks fed diets supplemented with *Phytabex-Plus* (T5) compared with those fed control diet (T1) in starter period (0-3 wks) and corresponding figures were 1.67 versus 1.78, respectively. Overall (0-5 wks) FCR data showed the same trend, but differences failed to be significant. These results are in agreement with those obtained by Safaa (2013), who reported broilers fed diets supplemented with 4% or more of ZADO® improved broiler productivity from hatch to 42 days of age.

Table (4): Effect of dietary treatments on carcass characteristics.

Items	Dietary Treatments					
	1	2	3	4	5	Sig.
Dressing %	69.10 ±0.84	68.42 ±0.58	68.66 ±0.51	67.59 ±0.31	67.73 ±0.93	NS
Abdominal fat %	0.96 ±0.09	1.04 ±0.03	1.22 ±0.06	1.13 ±0.18	1.27 ±0.22	NS
Liver %	2.44±0.22	2.23±0.06	2.46±0.11	2.67±0.06	2.49±0.09	NS
Gizzard %	1.49±0.27	1.32±0.08	1.36±0.17	1.34±0.08	1.28±0.06	NS
Heart %	0.66±0.06	0.61±0.02	0.59±0.02	0.69±0.03	0.58±0.01	NS
Giblets * %	4.59±0.40	4.16±0.11	4.42±0.13	4.72±0.14	4.36±0.07	NS
RTC # %	73.70 ±0.75	72.59 ±0.46	73.09 ±0.59	72.31 ±0.17	72.09 ±0.88	NS
Spleen %	0.18±0.04	0.17±0.04	0.22±0.01	0.19±0.01	0.17±0.02	NS
Thymus %	0.22±0.06	0.23±0.03	0.18±0.06	0.23±0.07	0.29±0.01	NS
Bursa %	0.15±0.04	0.08±0.02	0.10±0.02	0.11±0.05	0.08±0.02	NS

Sig. = Significance, NS = Non Significant.

*** Giblets = Liver + Gizzard + Heart, # Ready to Cook = (Carcass weight + Giblets weight)**

Carcass characteristics

Table (4) shows the effect of different dietary treatments on carcass characteristics for chicks at 5 weeks of age. Experimental treatments with different growth stimulating additives (T2:T5) had no significant effect on studied parameters compared with control (T1). The corresponding values for dressing percentages ranged between 67.59 and 69.10%, while ready to

cook (Hot carcass weight + giblets weight) percentages ranged between 72.09 and 73.70%. On the other hand, the birds fed *Bio-Strong* (T4) or *Phytabex-Plus* (T5) diets had lower dressing and ready to cook percentages, 67.59 and 72.31%, respectively. These differences were insignificant when compared with the other experimental treatments (T1:T3).

Similar observations were reported by Abd El-Gawad *et al*. (2004); El-Yamny and Fadel (2004) and Abdel-Azeem and Hamid (2006). Those authors reported that growth promoters had no significant differences among all groups in carcass weight and dressing percentages. On contrary, other results were disagree with those of Kalavathy, *et al*. (2003). They reported that the relative weight of abdominal fat pad was significantly reduced by 0.1% when mixture of Lactobacillus is supplemented to broiler diets at 28, 35 and 42 days of age compared with control group. Our results indicate that abdominal fat percentage was insignificantly increased by 8.33, 27.08, 17.71 and 32.29% for chicks fed diets supplemented with *Amio-Flash*, *Bio-Feed*, *Bio-Strong* and *Phytabex-Plus*, respectively as compared to those fed the control diet.

Table (5): Effect of dietary treatments on blood plasma parameters.

Items	Dietary Treatments					
	1	2	3	4	5	Sig.
Total protein (g/ dl)	6.27^{c} ±0.13	7.41^{b} ±0.13	6.62^{c} ±0.01	8.88^{a} ±0.01	7.86^{b} ±0.33	**
Albumin (g/ dl)	3.91^{bc} ±0.02	4.37^{b} ±0.17	4.10^{bc} ±0.01	4.94^{a} ±0.01	3.70^{c} ±0.29	**
Globulin (g/ dl)	2.36^{c} ±0.11	3.03^{b} ±0.31	2.52^{c} ±0.01	3.94^{a} ±0.01	4.16^{a} ±0.10	**
A/G ratio	1.65^{a} ±0.06	1.48^{ab} ±0.21	1.62^{a} ±0.01	1.25^{b} ±0.01	0.89^{c} ±0.07	**
Cholesterol (mg/ dl)	196.00^{b} ±3.46	227.00^{b} ±18.47	202.00^{b} ±1.15	281.00^{a} ±1.73	211.33^{b} ±21.94	**
AST (IU/ dl)	46.16^{a} ±0.23	44.45^{b} ±0.58	34.05^{c} ±0.01	44.60^{b} ±0.17	33.87^{c} ±0.33	**
ALT (IU/ dl)	38.02^{ab} ±13.54	51.98^{a} ±3.89	25.04^{ab} ±0.01	21.60^{b} ±0.17	47.41^{ab} ±11.17	*

[a, b, c] Means within the same row with different superscripts are significantly different.
Sig. = Significance, ** (P≤0.01) * (P<0.05)

Blood plasma constituents

Plasma constituents of broilers chicks measured in the present study estimated to show the metabolic status of chicks and their health as affected by feeding different growth promoters supplementation. Results in Table (5) show significant effect of dietary treatments on plasma total protein, Albumin, globulin, cholesterol and aspartate transaminase (AST), alanine transaminase (ALT). Results revealed that the concentration of plasma total protein, albumin and globulin were higher in chicks fed diets supplemented with different feed additives (T2: T5) when compared with those of control group. Plasma total protein in T2: T5 were higher by 18.18, 5.58, 41.63 and 25.36%, albumin by 11.77, 4.86, 26.34 and 5.37% and globulin by 28.39, 6.78, 66.95 and 76.27% respectively, in comparison with the control group and differences were significantly in most cases. In addition, the plasma

cholesterol was significantly (P<0.05) increased in group fed diets supplemented with *Bio-Strong* by 43.37% (196.0 versus 281.0) compared with the control group (T1). On the other hand, concerning liver enzymes activity, the plasma AST and ALT were significantly (P<0.05) decreased in groups fed diets supplemented with different growth stimulating additives. AST was decreased in groups fed diets supplemented with *Bio-Feed* (T3) or *Bio-Strong* (T4) compared with the control group (T1), without any significant differences. Similar observation was reported by Abd El-Gawad, *et al* (2004); El-Yamny and Fadel, (2004) and Tolba *et al*. (2004 a and b) who reported that, adding biological additives to broiler diets increase plasma total protein as well as albumin and globulin fractions compared to un-supplemented control group. However, it disagree with the findings of Eglal (2006) who reported that chicks fed diets with Bioaction had the highest averages of ALT at 28 and 51 days of age.

Economic evaluation

Data for economical evaluation are summarized in Table (6). The economical evaluation were calculated on the basis of recent prices of local market for feed ingredients and selling price of live broiler chickens in Qalubia, region. The average cost/ ton of experimental diets (starter and grower) are shown in Tables (1 and 2). It was clear that using different feed additives (T2: T5) relatively increased the cost/ ton final diets compared with the control (T1). The cost increase in both starter and grower were more pronounced by using *Amio-Flash* compared by *Bio-Strong*, *Phytabex-Plus* or *Bio-Feed*.

As shown in Table (6), it is interesting to state that under conditions of the present study, chicks fed *Amio-Flash* (T2) or *Phytabex-Plus* (T5) diets gave higher economic evaluation compared with the other treatments. This might be due to higher productive performance figures (body weight and feed conversion) compared with those fed other treatments. On the other hand, in general, using *Amio-Flash* (T2) in particular relatively increased the net return, economic efficiency and relative economic efficiency of broiler chicks compared with those fed the control diet (T1) during the total experimental period (0-5 wks) and the corresponding increasing values were 24.4, 16.2 and 16.2% respectively. Results of Table (6) show also the effect of different dietary treatments on performance index (PI), which was affected by different feed additives supplementation. PI was increased by 13.34, 0.98, 1.88 and 6.00% for chicks fed diet supplemented with *Amio-Flash*, *Bio-Feed*, *Bio-Strong* and *Phytabex-Plus*, respectively compared to those fed the control diet during the overall experimental period (0-5 wks). These results are in agreement with those obtained by Abd El-Gawad, *et al*. (2004); Abdel-Azeem and Hamid (2006) and Awad *et al* (2009) who reported that symbiotic or probiotic improved economic efficiency in broiler diets. In addition, Elnagar (2012) concluded that enzymes supplementaion to broiler diets gave better relative economic efficiency without adverse effect on productive performance or carcass traits until 6 weeks of age.

Table (6): Effect of dietary treatments on economic traits.

Items	Dietary Treatments					
	1	2	3	4	5	Sig.
Average feed intake (Kg)	2.68	2.83	2.68	2.63	2.78	-
Total Cost (LE)	15.23	16.20	15.30	15.25	15.29	-
Feed Cost (LE)	10.23	11.20	10.30	10.25	10.75	-
Live body weight (Kg)	1.38	1.52	1.39	1.38	1.45	-
Total return # (LE)	18.68	20.53	18.78	18.70	19.62	-
Net return (LE)	3.45	4.33	3.48	3.44	3.87	-
Economic efficiency	22.73	26.75	22.77	22.57	24.56	-
Relative economic efficiency *	100.00	117.69	100.17	99.29	108.04	-
Performance index [1]	69.32^{b} ±2.95	78.57^{a} ±2.67	70.00^{b} ±2.55	70.62^{b} ±1.44	73.48^{ab} ±0.10	*
Production efficiency factor [2]	153.47 ±25.56	181.35 ±32.04	158.31 ±17.26	194.88 ±0.11	195.97 ±8.35	NS

[a, b, c] Means within the same row with different superscripts are significantly different.
Sig. = Significance, ** (P<0.01) * (P<0.05). NS= Non Significant.
 # According to the local price of Kg LBW which was 13.50 L.E.
*** Assuming that the relative economic efficiency of control group equals 100.**
1: North (1981), 2: Emmert (2000), * According to the local price of Kg LBW which was 13.50 L.E.

CONCLUSION

From the present results, it could be stated that adding *Amio-Flash* (2 Kg/ ton), as growth stimulator or *Phytabex-Plus* (200 g/ ton) to practical broiler diets, would have a positive effect on the economical efficiency of broiler chicks, without any adverse effect on productive performance or carcass traits of the broilers comparable to the control.

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تـأثير المستحضـر الإنزيمـى وبعض منشـطات النمـو علـى الأداء الإنتـاجى لبـدارى التسمين المغذاة علائق أساسية من الذرة وكسب فول الصويا

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يهدف هذا البحث إلى معرفة تأثير إضافة مستحضر إنزيمى و بعض منشطات النمو إلى علائق البادئ والنامى لبدارى التسمين [بدون إضافة (كنترول)، *Amio-Flash* (٢ كجم/ طن)، *Bio-Feed* (١كجم/ طن)، *Bio-Strong* (١٥٠ جم/ طن) و مستحضر إنزيمى *Phytabex-Plus* (٢٠٠ جم/ طن)] على الأداء الإنتاجى وصفات الذبيحة وبعض مكونات بلازما الدم والكفاءة الاقتصادية خلال فترة النمو (صفر- ٥ أسبوع)

استخدم فى هذه الدراسة ١٢٠ كتكوت عمر يوم سلالة (Cobb) وزعت على 5 معاملات غذائية بكل معاملة ٣ مكررات بكل منها ١٠ كتاكيت وتم إجراء اختبار ذبح عند نهاية التجربة باستخدام ٣ طيور من كل معاملة وتم أخذ عينات الدم خلال الذبح لتقدير مكونات البلازما.

أظهرت النتائج:

وجود تأثير معنوى لوزن الجسم ومعدل الزيادة الوزنية للجسم واستهلاك العلف ومعامل التحويل الغذائى وكذلك دليل الإنتاج بإضاف منشطات النمو للعلائق مقارنة بالكنترول خلال الفترة الإنتاجية (صفر- ٥ أسبوع) حيث سجلت الكتاكيت المغذاة على علائق مضاف إليها *Amio-Flash* أو *Phytabex-Plus* أفضل النتائج للمقاييس السابقة مقارنة بالمعاملات الأخرى.

لم تتأثر معنوياً جميع قياسات الذبيحة نتيجة للمعاملات الغذائية بينما ارتفع محتوى بلازما الدم معنوياً فى البروتين الكلى والالبيومين والجلوبيولين والكوليسترول بينما انخفض انزيمات الكبد للكتاكيت التى غذيت على العلائق المضاف اليها *Amio-Flash* مقارنة بالكنترول.

تحسنت الكفاءة الاقتصادية للكتاكيت بالتغذية على العلائق المضاف إليها *Amio-Flash* أو *Phytabex-Plus* مقارنة بالكنترول وباقى المعاملات الأخرى.

أظهرت نتائج هذه الدراسة أن إضافة *Amio-Flash* أو *Phytabex-Plus* أن علائق بدارى التسمين قد حسن مقاييس الأداء الإنتاجى والكفاءة الاقتصادية دون أدنى تأير سلبى على صفات الذبيحة عند عمر ٥ أسابيع.