PRODUCTIVE PERFORMANCE AND BLOOD PLASMA CONSTITUENTS OF BROILER CHICKS FED DIETS SUPPLEMENTED WITH SOME NATURAL FEED ADDITIVES

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SUMMARY

A grower broiler experiment (from 1 to 5 weeks of age) was conducted to study the impact of various commercial feed additives on performance and economical efficiency of broiler chicks. These additives included commercial premixture of flavouring substance (Biostrong® 510), commercial enzyme preparation (Nutrikem dry® and symbiotic (Bio-gen®). A number of 120 Hubbard broiler chicks (1 week of age) were divided into 4 treatment groups (3 replicates of 10 chicks, each). Groups were assigned to 4 experimental diets: a basal diet of no additive (control), the basal diet supplemented with either 150 g/ ton Biostrong (T_1), 500g/ton Nutrikem dry (T_2) or 500 g/ton Bio-gen (T_3).

The results indicated that:

1- Supplementation of Biostrong or Nutrikem recorded insignificant higher body weight gain by (8 and 3%, respectively) than the control or Bio-gen groups.
2- Supplementation of Bio-gen recorded significant ($P<0.05$) higher feed intake and worst feed conversion (1.81) than those fed other dietary treatments, but numerically Biostrong and Nutrikem treatments (T_1 and T_2) represented the best feed conversion (being the same figure 1.54 g) compared with that fed control diet (1.65).
3- Carcass characteristics parameters (dressing, giblets and abdominal fat %) and carcass parts % (breast, thigh, drumstick and wing %) showed insignificant figures when chicks fed different dietary treatments.
4- Bone measurements (wet tibia weight and tibia width) showed insignificant figures, however tibia length and tibia Seedor index have significant differences for dietary treatments.
5- Biostrong (T_1) and symbiotic (T_3) significantly improved the total protein, and globulin values compared with T_2 group. However the T_3 treatment and control have the best A/G ratio.
6- Enzyme treatment (Nutrikem, T_2) decreased plasma triglycerides cholesterol and LDL concentrations compared with other treatments (T_1 and T_3).
7- Concerning economic evaluation, the best economical efficiency value was demonstrated when broiler chicks fed 150 g/ton Biostrong (T_1) and the value was 21% more when compared with that of broiler chicks fed control diet.

It could be concluded that supplementation basal diets with 150 g/ton Biostrong improved productive performance and enhanced economic efficiency of Hubbard broiler chicks.

Keywords: *Biostrong, symbiotic, enzyme preparation and broiler chicks.*

INTRODUCTION

Growth promoters are substances that are added to a nutritionally balanced diet to provoke response towards the exploitation of maximum genetic potential of the host, in terms of growth as well as improvement in feed conversion efficiency. There are different types of growth promoters which are used to exploit the broiler industry like antibiotics, probiotics, prebiotics, symbiotic, (probiotic plus prebiotic), exogenous enzymes, Aromatic plants, herbs or products including plant extracts, essential oils or the main components of the essential oil and certain other nutritional substances (Dhama *et al*., 2007, 2008, 2011; Mahima *et al*., 2012, 2013 and El-Faham *et al*., 2014, 2015).

Antibiotics are given at subtherapeutic dosage for stabilization of the microflora of intestine and for improving the performance in general along with prevention of certain specific pathological conditions of the intestine. However, when using antibiotics as growth promoters it should be kept in mind that theifor on long term basis must be avoided as it can give rise to resistance groups of microorganisms viz, gram negative bacteria (*E. coli* and *Slamonella* spp.) (Dibner and Richards, 2005; HasRsan*et al*., 2010 and

Senjya *et al*., 2012). Therefore, many countries tended to prohibit the using of antibiotics as growth promoters because of their side effect on both birds and human health (European commission, 2003).

As a result, the natural additives such as spices, herbs and their extracts are given to birds to improve their physiological and productive performance under normal or stress conditions (Tollba *et al*., 2004 a,b).

Biostrong® is a plant derived (phytogenic), feed additive for poultry. It is comprised of high quality proven active ingredients that improve digestion, enhance metabolic function and increase nutrient retention. So, Biostrong optimizes performance, production and profitability (Lee *et al*., 2004 and El-Faham *et al*., 2014). The active ingredients of biostrong are essential oils, bitter substances, pungent substances and saponins derived from herbs, spices and their extracts.

Numerous studies demonstrated that, a great number of medical and aromatic herbs as well as essential oils and pungent substances are used as natural growth promoters in broilers (Tollba and Hassan, 2003) in ducks (Gazalah and Ibrahim, 1996) and in Japanese quail (Abd El-Azeem *et al*., 2001).

Supplemental direct fed microbial has received special attention from the broilers industry to promote the balance and quality of the intestinal microflora for the host, but the efficacy of these products varies according to their production procedure and practical application (Salim *et al*., 2013). Moreover, probiotics can improve the metabolism of the host bird in various ways including absorptive capacity, protein metabolism, energy metabolism, fiber digestion and gut maturation (Yokota and Coates, 1982; Salter *et al*., 1974; Muramatsu *et al*., 1994; Furuse and Yokota, 1984; and Furuse *et al*., 1991 and Dhama and Singh, 2010). Several researchers reported that feeding symbiotic products (probiotic plus prebiotic) had improved the growth performance of broiler chickens (Mohnal*et al*., 2007 and Nematallah *et al*., 2015).

The application of exogenous enzymes in poultry nutrition has been driven by accruing benefits in terms of improved dietary nutrient utilization and growth performance (Hong *et al*., 2002 and Adeola and Bedford, 2004).

The improvements in growth of broilers fed a diet with enzymes supplementation may be interpreted based on eliminate the effects of ant nutritional factors (Yu et al., 2007), improve the utilization of dietary energy (Kocher *et al*., 2003), improve the utilization of protein (Abd El-Hady, 2012), prevents exponential multiplication of common pathogenic bacteria (Hillman, 1999). This is reflected in better flock performance, better litter quality and improved bird health, which in turn has a positive influence on total production costs (Saleh *et al*., 2005).

Therefore, the aim of the present trial was tostudy the effects of commercial enzyme preparation (Nutrikem dry®), Symbiotic (Bio-gen®) in comparing with (Biostrong-510®) incorporation in broiler diets on growth performance, carcass characteristics, blood plasma parameters and economic efficiency.

MATERIALS AND METHODS

The trial was conducted at Poultry Experimental Unit, Agriculture Experiment and Research Station at Shalakan, Faculty of Agriculture, Ain Shams University, in order to investigate growth performance, some blood components, carcass characteristics and economic efficiency of broiler chicks fed all-plant protein diets supplemented with either 0, 150 g/ton (Biostrong® 510), a commercial premixture of flavouring substance, 500 g/ton (Nutrikem dry®) -a commercial enzyme preparation or 500 g/ton symbiotic (Bio-gen®).

A total of 120 Hubbard broiler chicks (mixed sex) at one day old with an initial body weight (BW) of 44.0 g were obtained from a local commercial hatchery and used in this trial. Chicks were fed starter diet (23% CP and 3000/kcal ME/kg) for the first week of age and then randomly distributed into 4 starter dietary treatments (2-3 weeks) and grower diets (21CP and 3100 kcal ME/kg) until the end of the experimental period (5 weeks).

Biostrong® is a plant derived; feed additive for poultry and the active ingredients are essential oils, bitter substances, pungent substances and saponins derived from herbs, spices and their extracts. Nutrikem dry® contains a mix of exogenous enzyme (Xylanase, cellulose and Betaglucanase) and endogenous enzyme (Alpha amylase and protease), all enzyme inarched on matrix of lysophosphatydial choline.

Bio-gen® is considered as symbiotic contains the following ingredients: Bacillus subtillus (4×10^{12} CFU) 200 mg – yeast cell wall extracts of saccharomyces *cervisiae* (Beta-glucan + MOS).

Chicks were randomly divided into 4 equal groups, each was subdivided into 3 replicates with 10 chicks each. Chicks were housed randomly into battery brooders to 4 dietary treatments from 2 to 5 weeks, under similar conditions and disease control. As shown in Table (1), the experimental diets were

based on corn-soy diets and formulated to meet the nutrient requirements of broiler chicks according to NRC (1994). The BW and feed consumption were recorded by replicate weekly and mortality was recorded daily. From these data BWG, average daily feed intake (DFI), FCR corrected for mortality and mortality rates were calculated cumulatively.

At the end of the trial (5 weeks of age), 3 chicks per each treatment were randomly chosen, weighed, slaughtered and eviscerated. Carcass, heart, liver, gizzard, and abdominal fat were weighed and relative weights to live BW (g/100 g of BW) were calculated. Carcass parts % were evaluated using breast, thigh, drumstick and wing weights and percentages were calculated in relation to carcass weight.

Bone quality measurements were evaluated using wet and dry tibia weight, tibia length and weight and tibia seedor index (SI) using the following equation suggested by Seedor *et al*. (1991). [SI = Tibia dry weight (g) / tibia length (cm)].Blood samples were collected in dry clean centrifuge tubes from the slaughtered birds and plasma were separated by centrifugation at 3000 (rpm) for 15minutes. Clear plasma samples were separated into Ependorph tubes and kept in the deep freezer at-20°c until chemical analysis. Values of total protein, albumin, triglyceride, total cholesterol, low density lipoprotein (LDL) and high density lipoprotein (HDL) were estimated by using commercial diagnosing kits (produced by Bio-diagnostic company, Egypt), the globulin values were obtained by subtracting the values of albumin from the corresponding values of total protein.

Economic parameters of production including feeding cost (starter and grower diets) income and returns per bird were calculated. Economic efficiency was calculated as net return / total cost and relative economic efficiency assuming control treatment 100%.

Data were statistically analyzed by analysis of variance (ANOVA) one-way 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 set at minimum ($P \leq 0.05$).

RESULTS AND DISCUSSION

Table (2) shows the effect of dietary treatments on the productive performance [body weight gain (BWG), feed intake (FI) and feed conversion ratio (FCR) during starter, grower and overall experimental period]. The results of BWG showed that birds fed biostrong supplemented diet (T_1) exhibited significantly ($P<0.05$) higher BWG during the period (4-5 weeks) and insignificant higher during starter period (2-3 weeks) and overall experimental period (2-5 weeks) increased gain compared with control group.

At 5 weeks of age, birds fed the Biostrong (T_1) or enzyme preparation (T_2) supplemented diets recorded 8 and 3% more gain, respectively than the control or Bio-gen (T_3) groups. The differences among treatments were not significant. Feed intake and feed conversion ratio were significantly different among treatments during studied period (1-5 weeks). Moreover, during starter, grower and the entire period birds fed Bio-gen supplemented diet (T_3) consumed significantly ($P<0.05$) more feed than the other groups. No significant differences were detected on FI between control group and those fed Biostrong (T_1) or Nutrikem dry (T_2) supplemented diets during the periods from 4-5 or 2-5 weeks of age.

The results of FCR showed that, no significant differences were detected between the control group and those fed Biostrong (T_1) or Nutrikem dry (T_2) supplemented diets during growing and the entired period. Moreover, feeding T_1 or T_2 diets gave the best FCR [being the same figure (1.54)] compared with control group (1.65).

On the other hand, the worst FCR was found in birds fed Bio-gen supplemented diet (T_3) being (1.81),besides, the differences between treatments were significant and this reduction may be due to the high feed intake during experimental period (1-5 weeks of age). These results indicated the superiority of Biostrong compared to Nutrikem or Bio-gen and addition of either Biostrong or Nutrikem improved the performance of growing broilers expressed as BWG or FCR. Chicks fed such supplemented diets utilized feed more efficient than the control group.

The results of the present study confirmed those obtained by El-Faham *et al*. (2014), Al-Khdri (2013) and Rahimi *et al*. (2011) who concluded that higher body weight are noted in the broilers fed herbs and herbal products. These productsare incorporated in poultry diet to replace synthetic products in order to stimulate or promote the effective use of feed nutrients which may subsequently result in more rapid body weight gain, higher production rates and improved feed efficiency.

Moreover, supplementation of spices and herbs could have many benefits to broilers health and performance such as having antioxidative potential, antimicrobial activity and substances enhancing digestion by stimulating endogenous enzymes (Dorman and Deans, 2000; Lee *et al*., 2004; Ghazalah and Ali, 2008; Steiner, 2009 and Al-Khadri, 2013).

Moreover, these results are in agreement with several reports regarding enzyme addition in broiler corn-SBM basal diets (Salah *et al*., 2005; Kalmendal and Tauson, 2012; and Safaa, 2013), who reported that supplementing corn-SBM based broiler diets with an enzyme product containing xylanase, amylase and protease improved body weight gain and feed efficiency compared with the supplemented diets.

Carcass characteristics:

Table (3) shows the effect of different dietary treatments on carcass characteristics for the chicks slaughtered at the end of 5 weeks of age. Experimental treatments (T_{1-3}) had no significant effect on studied parameters compared with control, except liver percentages. The corresponding values for dressing percentages ranged between 72.69 and 74.69%, while giblets percentages ranged between 3.11 and 4.19% and abdominal fat percentages ranged between 1.59 and 1.84%, however, the differences between treatments were insignificant.

Moreover, it is worth to note that broiler chicken fed diet supplemented with Bio-gen (T_3) during experimental period (5 weeks) reflected the highest, insignificant dressing, giblets, abdominal fat and significant liver percentages compared with those fed other dietary treatments.

These findings are in contrast with the results obtained by Hassan *et al*. (2004), who concluded that addition of medicinal and aromatic plants in broiler diets had significantly higher dressing % than those fed the control diet. Also, results are disagreement with café' *et al.* (2002), who noted a significant increase in dressing percentage at 42 days of age in broilers given a corn-SBM diet supplemented with commercial enzymes. Conversely, Ali (1999) detected that there were no significant differences in absolute and relative weights of empty carcass, total giblets, abdominal fat and total edible parts between the control group and the birds fed diets containing probiotics.

Carcass parts (%):

The results in Table (4) shows the relationship between dietary treatments and carcass parts of broiler chicks slaughtered at the end of the experiment (5 weeks of age). No significant differences in all carcass parts percentages (breast, thigh, drumstick and wing %) were obtained due to experimental treatments, but there was significant increase in breast muscle % and pectoralis major % by feeding Biostrong diet (T_1) compared with those fed control diet, the corresponding figures were (29.15 and 23.07 vs 24.45 and 19.25%, respectively).

Bone measurements:

Dietary treatments had a significant effect upon some of tibia bone traits included in this study as shown in Table (5). Tibia length (mm) ranged between 9.16 and 8.46 (mm) and chicks fed diet supplemented withBiostrong (T_1) gave the highest figure while, birds fed Nutrikem supplemented diet (T_2) had the lowest figures (8.46 mm) and differences among treatments were significant. In the same side, Tibia Seedor Index (SI), wet tibia weight (g) and percentage of tibia weight in relation to body weight for chicks fed Nutrikem supplemented diet (T_2) reflected the highest figures than those fed Bio-gen diet (T_3). The corresponding values for Seedor Index ranged between 0.56 and 0.69 and wet tibia ranged between 0.56 and 0.69 and wet tibia weight ranged between 10.07 and 12.37, while tibia weight % ranged between 0.45 and 0.57 % and in most cases differences between treatments were insignificant.

These findings are in contrast to the results of (El-Faham *et al*., 2014) who found that diet supplemented with probiotic, Biostrong, Pungent substance or Zinc bacitracin had no significant effect on different bone measurements. Ziaie *et al*. (2011) indicated that supplementation broiler diet with antibiotic and its alternative such as prebiotic, probiotic, commercial herbal blend and organic acid could improve bone characteristics.

Effect of experimental treatments on some blood parameters of growing chicks:

Table (6) shows the effect of different treatments on some blood components of growing chicks. Generally, some blood components have significantly affected by different treatments and others have not significantly affected ($P \leq 0.05$).

Total protein, albumin, globulin and triglycerides have been significantly affected. Biostrong (T_1) and symbiotic (T_3) have improved the total protein, albumin and globulin values compared with control, although A/G ratio recorded the best values for birds that treated with T3, and control but the differences have failed to reach in significances.

Concerning to plasma lipids, birds that fed on Nutrikem (T_2) showed the lowest values for triglycerides, cholesterol and LDL compared to other treatments (T_1 and T_3). However the control group recorded the lowest levels of total cholesterol, LDL and HDL compared to other treatments (T_{1-3})

From the previous results it could be concluded that Biostrong, Nutrikem and Bio-gen supplements have improved the general productive performance of broiler chicks in terms of LBW and FCR.

Alvarega *et al*. (2011) and Hermier (1997) reviewed that growth of adipose tissue depends mainly on triacylglycerol transported by LDLs and this could alter the metabolism of lipoprotein on three levels: liver, plasma and adipose tissue.

These results are in close agreement to results of (Nematallah *et al*., 2014), who mentioned that Biostrong and other feed additives may have many types of components that provide unique health benefits by decreasing free radical and increasing the antioxidant capacity these components may be reflected in increased performance and enhance the immune response of birds.

Economical evaluation:

Data for economic evaluation are summarized in Table (7). The price figures are based on the recent prices of local market for feed ingredients and selling price of chickens in Qaliobeya region, Egypt, during April 2013.

Results in Table (7) showed that, chicks fed diet contained Biostrong (T_1) or Nitrokem (T_2) had the best economical and relative efficiency values being (27.4 and 25.9) and (121 and 115%) respectively (this may be due to total and net revenue / chick and good performance) as compared with control. Whereas, chicks fed diet contained Bio-gen (T_3) had the lowest corresponding values, being 16.8 and 74.3%, respectively.

Abd El-Latif *et al*. (2002) reported that, the profitability of adding 0.5% probiotic recorded the worst value of economic efficiency compared with control group. On the other hand, Hassanein (2006) concluded that symbiotic or probiotic displayed a greater efficiency as growth promoters for broiler and gave the best total net revenue and economic efficiency. It could be recommended from this study to supplement 150 g/ton of Biostrong® to broiler diets up to 5 weeks of age.

Table (1). Composition and calculated analysis of the basel experimental starter and grower diets.

Ingredients	Starter diet (2-3wks)	Grower diets (4-5 wks)
Yellow corn	55.99	59.89
Soy bean meal (44% cp)	28.79	26.29
Corn gluten (60% cp)	8.99	7.01
Soy bean oil	1.50	2.50
Limestone	1.60	1.46
Mono caph	1.85	1.64
L-Lysine Hcl	0.39	0.32
Dl-methionine	0.29	0.29
Salt	0.30	0.30
Premix*	0.30	0.30
Total	100.00	100.00
Calculated analysis		
Crude protein %	23.00	21.00
ME (Kcal/kg)	3000	3100
Calcium %	1.00	0.91
Av. Phosphorus %	0.51	0.46
Meth. %	0.66	0.62
Meth. + cyst. %	1.05	0.98
Lys. %	1.40	1.62

**Vitamin & mineral premix supplied each kg of feed with: Vit. A:12000 IV; Vit. D3 2000 IV; Vit. E: 40 mg; Vit. K3: 2 mg; Vit. B1: mg; Vit. B2: 4mg; Vit. B6: 1.5 mg, Pantothenic acid: 10 mg; Vit. B12 0.01 mg; Folic acid: 1.5 mg; niacin: 20 mg; biotin: 0.05 mg; zn: 55 mg; Fe: 30 mg; I: 1 mg; Se: 0.1 mg; Mn: 55 mg; Cu: 0.5g; Co.: 0.25 mg and ethoxyguin 3000 mg.*

Table (2). Effect of dietary treatments on growth performance of broiler chicks.

Items	Dietary treatments				Sig. of Differences
	Control	T_1	T_2	T_3	
Initial body weight (g), 1wk	125.5±0.87	132.5±0.87	122.5±0.29	134.0±0.58	NS
			1-3 wks of age		
Body weight gain (g)	680±2.60^{a}	696±16.46^{a}	634.5±25.12^{b}	716.5±3.75^{a}	*
Feed Intake (g)	985.5±15.88^{a}	911±38.11^{b}	949±34.06^{ab}	1044.5±15.88^{a}	*
Feed conversion (g feed / g gain)	1.45±0.02^{a}	1.32±0.08^{b}	1.50±0.01^{a}	1.46±0.02^{a}	*
			4-5 wks of age		
Body weight gain (g)	1301±5.20^{bc}	1438±2.02^{a}	1400.5±58.02^{ab}	1265.5±1.44^{c}	*
Feed Intake (g)	2268±6.93^{b}	2371.5±2.02^{b}	2173.5±66.68^{b}	2550±132.21^{a}	*
Feed conversion (g feed / g gain)	1.69±0.06^{b}	1.65±0.01^{b}	1.63±0.13^{b}	1.97±0.12^{a}	*
			2-5 wks of age		
Body weight gain (g)	1982±2.6 100	2135±14.43 108	2035±32.91 103	1982±5.20 100	NS
Feed Intake (g)	3253±22.81^{b} 100	3283±36.08^{b} 101	3123±100.75^{b} 96	3595±116.34^{a} 111	*
Feed conversion (g feed / g gain)	1.65±0.02^{b} 100	1.54±0.03^{b} 93	1.54±0.08^{b} 93	1.81±0.06 110	*

a,b,c means have different letter(s) in the same raw are significantly different (P≤0.05)
NS: not significant
Control; T1 (150 g/ton Biostrong); T2 (500 g/ton Nutrikem); (T3 (500 g/ton Bio-gen)

Table (3). Effect of different experimental diets on carcass characteristics of broiler chicks.

Items	Dietary treatments				Sig. of Differences
	Control	T_1	T_2	T_3	
Live body weight (g)	2182±128.04	2297.67±110.63	2102±114.72	2221.±116.68	NS
Carcass weight (g)	1626.3±121.84	1701.3±79.02	1527±67.0	1644±96.9	NS
Dressing %	74.57±1.13	73.26±1.04	72.69±0.98	74.69±0.84	NS
Liver %	2.12±0.06^{ab}	1.61±0.37^{b}	1.90±0.23^{ab}	2.56±0.37^{a}	*
Gizzard %	1.11±0.16	1.02±0.08	1.31±0.12	1.14±0.04	NS
Heart %	0.60±0.03	0.48±0.02	0.59±0.08	0.48±0.01	NS
Giblets %	3.82±0.19	3.11±0.42	3.80±0.41	4.19±0.36	NS
Abdominal fat %	1.59±0.10	1.68±0.17	1.69±0.35	1.84±0.29	NS

a,b means have different letter(s) in the same raw are significantly different (P≤0.05)
NS: not significant

Table (4). Effect of different experimental diets on carcass parts (%) of broiler chicks.

Items	Dietary treatments				Sig. of Differences
	Control	T_1	T_2	T_3	
Breast	47.13±0.16	47.67±3.78	48.57±1.43	51.37±1.47	NS
Breast muscle	24.45±2.21^{b}	29.15±3.05^{a}	25.62±0.45^{b}	26.25±1.35^{ab}	*
Pectorals major	19.25±1.36^{b}	23.07±2.68^{a}	21.18±0.73^{ab}	21.3±1.35^{ab}	*
Pectorals minor	5.20±0.89	6.07±0.76	4.44±0.30	4.95±0.06	NS
Thigh	28.08±0.71	28.17±1.57	26.05±0.94	27.33±0.39	NS
Drumstick	14.12±0.75	13.61±1.18	14.67±0.29	12.61±0.99	NS
Wing	11.16±0.70	10.59±1.12	10.45±0.77	8.8±0.98	NS

a,b means have different letter(s) in the same raw are significantly different (P≤0.05)
NS: not significant.

Table (5). Effect of different experimental diets on some tibia bone measurements.

Items	Dietary treatments				Sig. of Differences
	Control	T_1	T_2	T_3	
Wet tibia weight (g)	11.33±0.03	10.37±0.04	12.37±0.03	10.07±0.01	NS
%	0.54±0.06	0.45±0.02	0.57±0.03	0.47±0.01	NS
Tibia length (mm)	$8.66±.0.24^{ab}$	$9.16±0.14^{a}$	$8.46±0.17^{b}$	$8.86±0.13^{ab}$	*
Tibia width (mm)	0.65±0.02	0.70±0.05	0.63±0.03	0.70±0.01	NS
Tibia Seedor Index (SI)	$0.65±0.03^{ab}$	$0.62±0.02^{ab}$	$0.69±0.03^{a}$	0.56±0.01b	*

a,b means have different letter(s) in the same raw are significantly different (P≤0.05)
NS : not significant

Table (6). Effect of experimental treatments on some blood plasma components of growing chicks.

Items	Dietary treatments				Sig.
	Control	T_1	T_2	T_3	
Total protein (g/dl)	$3.36±0.29^{a}$	$4.21±0.1^{a}$	$2.15±0.35^{b}$	$3.98±0.04^{a}$	*
Albumin (g/dl)	$1.54±0.11^{ab}$	$2.16±0.10^{a}$	$1.40±0.32^{b}$	$1.65±0.29^{ab}$	*
Globulin (g/dl)	$1.82±0.34^{a}$	$2.04±0.04^{a}$	$0.75±0.07^{b}$	$2.34±0.29^{a}$	*
A/G ratio	0.96±0.21	1.06±0.06	1.86±0.42	0.76±0.20	NS
Triglyceride (g/dl)	$78.24±5.18^{ab}$	$85.29±10.20^{ab}$	$59.12±12.07^{b}$	$112.30±7.87^{a}$	*
Total cholesterol (g/dl)	88.28±24.40	135.73±4.25	113.94±28.62	130.80±3.48	NS
Low density lipoprotein (g/dl)	67.06±24.31	108.90±5.86	85.72±17.38	101.27±3.15	NS
High density lipoprotein (g/dl)	21.22±6.49	26.84±4.11	28.22±11.24	29.52±11.25	NS

a,b means have different letter(s) in the same raw are significantly different (P≤0.05)
NS : not significant

Table (7). Effect of feeding different dietary treatments on economic evaluation.

Items	Dietary treatments			
	Control	T_1	T_2	T_3
Live body weight gain (kg)	1.982	2.135	2.035	1.982
Price /kg body weight (LE)	13	13	13	13
Total revenue / chick (LE)	25.766	27.755	26.455	25.766
Total feed intake /chick (kg)	3.253	3.283	3.123	3.595
Total feed cost/chick (LE)	11.939	12.148	11.604	13.429
Fixed cost/chick (LE)	8	8	8	8
Total cost/chick (LE)	19.939	20.148	19.604	21.429
Net revenue (LE)	5.827	7.607	6.851	4.337
Economic efficiency (EE)	22.6	27.4	25.9	16.8
Relative (EE)%	100	121	115	74.3

Total revenue/chick = Body weight gain x price of one kl body weight (13 LE)
Total feed cost /chick = Total feed intake x price of one kg feed (starter plus grower) during April 2013
Fixed cost / Chick = Labor, medication and Vaccination, Electricity, Water, Care … etc. = 8 LE
Total cost / chick= Cost of feeding + fixed cost
Net revenue = Difference between total revenue and total cost
Economic efficiency (EE) = Netrevenue / total cost x 100

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الأداء الإنتاجى ومكونات بلازما الدم لبدارى التسمين المغذاة على علائق مضاف إليها بعض الإضافات الطبيعية

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أجريت تجربة على بدارى التسمين (2-5 أسبوع فى العمر) لدراسة تأثير بعض إضافات الأعلاف على الأداء الإنتاجى والعائد الاقتصادى وقد اشتملت الإضافات كلاً من: البيوسترونج وهو مخلوط تجارى من المنكهات و النيتروكيم وهو مستحضر تجارى للإنزيمات والبيوجين وهو مستحضر تجارى سمبيوتك.

تم استخدام عدد (120) كتكوت هبرد عمر أسبوع ووزعت هذه الكتاكيت على 4 معاملات غذائية تجريبية لكل منها 30 كتكوت فى 3 مكررات (10 كتكوت/ مكرر).

وكانت المعاملات الغذائية كالآتى:

عليقة قاعدية بدون إضافات (كنترول)

عليقة قاعدية مضاف إليها 150 جم / طن بيوسترونج (T_1)

عليقة قاعدية مضاف إليها 500 جم / طن النتروكيم (T_2)

عليقة قاعدية مضاف إليها 500 جم / طن بيوجين (T_3)

أوضحت النتائج المتحصل عليها أن:

1- إضافة البيوسترونج (T_1) أو النتروكيم (T_2) يعطى أعلى معدلات وزن جسم مكتسب (8 و 3% على التوالى) بالمقارنة بمجموعتى الكنترول أو البيوجين (T_3).

2- إضافة البيوجين (T_3) إلى عليقة بدارى التسمين يؤدى لزيادة استهلاك العلف معنوياً مع معامل تحويل غذائى (1.81) بالمقارنة بالمعاملات الغذائية الأخرى. معاملات بيوسترونج T_1 والنتروكيم T_2 سجلت رقمياً أفضل معامل تحويل غذائى لكليهما (1.54) بينما معاملة الكنترول (1.65).

3- قيم صفات الذبيحة (% ذبيحة و % للحوائج و% دهن البطن) والقطعيات (% للصدر، % فخذ، % دبوس و% جناح) لم تتأثر ولم تختلف معنوياً بالمعاملات الغذائية المختلفة.

4- قيم صفات العظم (وزن وسمك عظمة الساق) لم تتأثر بالمعاملات المختلفة بينما (طول عظمة الساق وSeedor Index) تأثرت معنوياً بالمعاملات الغذائية المختلفة.

5- الطيور التى تغذت على البيوسترونج والبيوجين أظهرت تحسناً معنوياً فى كلاً من البروتين الكلى والألبيومين والجلوبين بينما تحسنت فقط نسبة A/G فى الطيور التى تغذت على البيوجين. من ناحية أخرى أدت المعاملات التى تغذت على عليقة النتروكيم إلى انخفاض غير معنوى فى كلاً من تركيزات الجلسريدات الثلاثية والكوليسترول والدهون LDL مقارنة بالمجاميع الأخرى.

6- الكفاءة الاقتصادية أظهرت ان معاملة البيوسترونج (T1) اعطت أفضل عائد اقتصادى حيث تفوقت على مجموعة الكنترول بمعدل (21%)

الخلاصة: إضافة البيوسترونج بمعدل 150 جم/طن إلى علائق بدارى التسمين أدى إلى تحسن الأداء الإنتاجى والكفاءة الاقتصادية لكتاكيت التسمين (سلالة الهبرد).