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RESPONSE OF BROILER CHICKS STRAIN TO SOME GROWTH PROMOTORS AND THEIR INTERACTION ON PERFORMANCE, CARCASS CHARACTERISTICS AND BLOOD PLASMA CONSTITUENTS

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ABSTRACT: Two hundred and forty broiler chicks at one day old of both Cobb and Avian strains were used in this experiment. Chicks weighted and randomly divided into four treatment groups of three replicates (10 chicks) for each strain to investigate the response of broiler chicks strain to some growth promoters supplementation (Amio-Flash, Bio-Strong and Bio-Feed) on growth performance, carcass characteristics and some blood plasma constituents as well as economical efficiency.

The results indicated that:

- Cobb chicks had consumed significantly higher amount of feed than Avian chicks. Broiler chicks fed diets supplemented with Amio-Flash recorded the highest values of live body weight (LBW), body weight gain (BWG), performance index (PI)and feed consumption (FC), also recorded best values of feed conversion ratio, protein conversion ratio (PCR) and calorie conversion ratio (CCR) than those fed other experimental diets. Interaction between strain and growth promoters supplementation had significant effect on LBW, BWG, PI and FC.
- Percentages of carcass and total edible parts were significantly higher for Avian broiler chicks comparing Cobb chicks.
- Cobb chicks had significantly higher plasma total protein, Globulin, cholesterol and AST constituents compared to Avian chicks., Also, cholesterol increased and A/G ratio decreased significantly by adding different growth promoters to the diets as compared to control. Interaction between strain and growth promoters supplementation had significant effects on all plasma constituents.
- Feeding economical efficiency was improved for Cobb broiler chicks only by feeding diets supplementing with Amio-Flash than control. These results indicated that supplementing Amio-Flash as growth promoter to Cobb strain chicks could be used to maximize growth performance as well as economical efficiency without adverse effects on carcass traits during period (0-5 wks of age).

Key Words: Strain, Growth Promoters, Broilers, Carcass and Blood Constituents.

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INTRODUCTION

The use of antibiotic growth promoters has been banned in many countries, because of public concerns about their residues in the animal products and the development of antibiotics resistant bacteria (Lee *et al.* 2004).

Nowadays, there is a tendency to use alternative additives such as herbs, spices, essential oils extracted from aromatic plants, enzymes, organic acids and probiotics were used as growth promoters in poultry diets in many countries for organic poultry production (Griggs and Jacob, 2005). Also, to avoid the residual cumulative effect of antibiotics or synthetic drugs in final products of animals, which have a positive effect on the human health (Schramm *et al.* 2003).

Growth promoters are added to livestock food with the aim to improve the growth of chickens and improve the utilization of food and in this way realize better production and financial results (Peric *et al.* 2009). Probiotic have been used for poultry as feed additives to replace the use of antibiotics and synthetic chemical feed supplements with positive statistical effects on growth performance (Onifade *et al.* 1999). Jin *et al.* (1998) reported that, probiotic act as growth promoters, feed savers, nutritional bio-regulators, immune stimulators and help in improving performance and health.

Also, Ghazalah *et al.* (2007) indicated that during period (7-35 day), it is preferable to use either avi-bac as commercial probiotic growth promoter in broiler diet.Moreover, Toghyani *et al.* (2011) reported that diet supplemented with probiotic and prebiotic increased body weight of broilers at 28 and 42 days of age.

On the other hand, many studies have been reported that supplementation of probiotics or prebiotics has no positive effect on broiler chicks performance (Ahmed, 2004 and Rodríguez, *et al.* 2012). They mentioned that performance parameters and nutrient digestibility were not affected by dietary inclusion of inulin, *Enterococcus faecium* or *inulin plus Enterococcus faecium*. Therefore, dietary supplementation of probiotic (Bio-plus 2B) or prebiotic (Bio-MOS) did not significantly affect broiler performance (Midilli *et al.*, 2008).

Herbs have been used as human food and for medicinal purposes for centuries. It has been found that natural additives such as herbs, edible plants, some medicinal plant, medicinal plant extracts, plant products and isolated phytochemical constituents have been suggested as non-traditional feed additives or growth promoters in broiler diets to improve growth, feed conversion, immune response of birds, nutrient digestibility and reduce the cost of feed (Abaza 2001; Al-Harthi, 2002 and Abou-Sekken *et al.* 2007).El-Faham *et al.* (2015) stated that broiler chicks fed on basal diet supplemented with 250 mg thyme oil/kg diet gave an equal performance to control diet with improving bacterial media in small intestine and improving enzymes activity in ileum.

The objective of this study is to investigate the response of broiler chicks strain (Cobb and Avian) to some growth promoters supplementation (Amio-Flash, Bio-Strong and Bio-Feed) in the diet on productive performance, carcass characteristics, some blood plasma constituents as well as economic efficiency.

MATERIALS AND METHODS

This study was conducted at Poultry Experimental Unit, Agricultural Experiment and Research Station, Faculty of Agriculture, Ain Shams University.

Amio Flash is a dry stabilized preparation, it is a live naturally– occurring microorganisms for poultry feeds (*Lactobacillus bacteria*, *Aspergillus oryzae* and Torellobsis Aotis yeast with Fructo Oligo Saccarides) and other ingredients such as MannanOligo Saccharides with Beta gluccan, Amino Acids (Methionine + Lysin) and some vitamins (Betaine and L-Carnetin).

Bio-strong is a plant derived phytogenic, feed additive for poultry. The active ingredients of bio-strong are essential oils, butter substances, pungent substances and saponis derived from herbs, spices and their extracts.

Bio-feed is a dry 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, *Aspergillusoryzae*, 10^5/ g and *Trichoderma longibrachiatum*, 10^5/ g) with a carrier of *Saccharomyces cerevisiae* up to 1 Kg.

Two hundred and forty broiler chicks at one day old of both Cobb and Avian strains were used and randomly allocated to four dietary treatment groups for each strain. Each treatment group for each strain containing 30 chicks which were allocated into three replicates, each replicate contained 10 chicks. The experimental treatments were as follows:

1- Chicks were fed the basal diets (control), free from any natural growth promoter as shown in Table (1).
2- control + 0.2% Amio-Flash
3- control + 0.1% Bio-Strong
4- control + 0.015 % Bio-Feed

Broiler chicks in all treatments were reared under similar hygienic and managerial conditions. They were housed in well ventilated brooding pens. Wheat straw was used as a litter; feed and water were provided *ad-libitum* throughout the experimental period.

Individual live body weight, body weight gain, feed consumption, feed conversion (feed/gain) were recorded. Growth rate was calculated according to the following equation:

$$\text{Growth rate} = \frac{W2 - W1}{½\,(W1 + W2)} \times 100$$

Production index was calculated as live body weight (kg)/feed conversion ratio x 100 according to North (1981). While, protein conversion ratio (PCR) and calorie conversion ratio (CCR) were calculated in relation to the feeding regimes.

Three chicks from each treatment were chosen randomly for slaughter test carcass parts were weighed and calculated as a percentage of live body weight.

Individual blood samples during slaughter were taken from two strains within each treatment and collected into tubes. Plasma was collected to determine blood metabolites (total protein, albumen, globulin, A/G ratio, cholesterol, AST and ALT) calorimetrically by using commercial kits (Spectrum Bio-Diagnostic Company, Hannover – Germany).

The economical efficiency was calculated from input-output analysis based on the total feed cost (L.E/chick) at the end of the experiment for each treatment depending on the local market prices of the ingredients used for formulating the experimental diet. Economic efficiency and relative economic efficiency were calculated.

Statistical analysis: Data were subjected to a two way analysis of variance concerning strain and treatment as main effects and their interaction by using the general linear model (GLM) procedure of SAS User's Guide (2002) according to the following linear model:

$Y_{ijk} = \mu + S_i + T_j + ST_{ij} + e_{ijk}$

Where:

Y_{ijk}= Trait measured,

μ= Overall mean,

S_i= Effect of strain (i= 1 and 2),

T_j= Effect of treatment (j= 1, 2, 3 and 4),

ST_{ij}=Interaction between strain and treatment,
E_{ijk}= Experimental error
When significant differences among means were found, means were separated using Duncan's multiple range tests (Duncan, 1955).

RESULTS AND DISCUSSION

Growth performance:
Results of Table (2) showed that live body weight (LBW) or body weight gain (BWG) were insignificantly affected by strain at the overall experimental period (0-5 wks), whereas, it was significantly affected by growth promoters supplementation. LBW of Avian strain was lower by 1.78% than Cobb chicks at 5 weeks of age. LBW was significantly increased by 4.48% for chicks fed diet supplemented with Amio-Flash than those fed the control diet at 5 wks of age, whereas it was insignificantly decreased by 2.97 and 5.66% for chicks fed diets supplemented with Bio-strong and Bio-feed respectively.

Interaction between strain and growth promoters supplementation had significant effect on LBW at 5 wks of age. Cobb chicks fed diets supplemented with Amio-Flash reflected the highest LBW (1520.89 g). While, Avian chicks fed diets supplemented with Bio-feed gave the lowest LBW (1292.31) compared with other treatments.

Cobb broiler chicks had higher BWG by 1.9% than Avian chicks during period (0-5 wks) of age (Table 2). On the other hand, broiler chicks fed diets supplemented with Amio-Flash (T_2) had significantly higher BWG (1442.77g) than those fed control diets (1378.64g) while, chicks fed Bio-strong (T_3) or Bio-feed (T_4) showed the lowest figures being 1336.24 and 1297.75, respectively.

Interaction between strain and growth promoters supplementation had significant effect on BWG during overall experiment period. Cobb broiler chicks fed amino-flash during experimental period reflected the highest significant body weight gain compared with other treatments. No significant difference between strains, treatments and their interaction for Growth rate was detected.

Results show insignificant effect between strains for performance index (PI), while PI was significantly affected by growth promoters supplementation (Table 2).
Chicks PI was increased by 5.34% for chicks fed diets supplemented with Amino-Flash, whereas, PI was decreased by 6.26 and 9.24% for chicks fed diets supplemented with Bio-Strong and Bio-Feed, respectively as compared to those fed the control diet.
Chicks PI values were significant affected by the interaction between strain and growth promoters supplementation. Moreover, feeding diets supplemented with Amio-Flash to Cobb chicks strain showed the highest PI (78.57) followed by those fed control diets to Avian chicks (78.52), while Avian chicks strain fed Bio-Strong or Bio-Feed had the lowest PI (67.96 and 64.17, respectively) however, differences failed to be significant.

Feed consumption (FC) had significantly affected by strain, it could be noticed that Cobb chicks had consumed significantly higher amount of feed than Avian chicks (Table 3). Feed consumption of Cobb broiler chicks was significantly increased by about 2.97% more than Avian broiler chicks. Chicks fed diets supplemented with Amio-Flash (T_2) showed the highest FC (2738.78 g) while, chicks fed diets supplemented with Bio-feed (T_4) had the lowest figures (2604.84 g). Interaction between strain and growth promoters supplementation had significantly affected on FC. In addition, Cobb broiler chicks fed diets supplemented with Amio-Flash showed the highest feed consumption (2827.87g) while, Avian broiler chicks fed Bio-feed had the lowest figures being (2528.28g). Feed conversion ratio (FCR) showed the same trend since Avian chicks were more efficient in conversion their feed into body gain compared with Cobb broiler chicks. The corresponding figures were 1.95 versus 1.97 with insignificant differences between the two strains. The best FCR was detected for the Avian broiler chicks fed control diets (T_1, 1.86) or Avian chicks fed diets supplemented with Amio-flash (T_2, 1.88).

The superior increase in live body weight and body weight gain in broiler chicks fed diets supplemented with Amio-Flash are in harmony of those obtained by other investigators, (Khaksefidi and Ghoorchi, 2006, Timmerman *et al* 2006, Liu *et al* 2007, Mountzouris *et al* 2007, Torres-Rodriguez *et al* 2007,Ashayerizadeh *et al* 2009, Alkhalf *et al* 2010, Kim *et al* 2011 and Houshmand *et al* 2011).

Results in Table (3) showed that protein conversion ratio (PCR) and calorie conversion ratio (CCR) were insignificantly affected by stain or growth promoters supplementation and interaction between strain and growth promoters addition.

The best PCR and CCR were detected for Avian chicks fed control diets (Avian- T_1, 0.41 and 5.70, respectively). On the other hand, the worst values found in Avian chicks fed Bio-Feed (Avian-T_4, 0.46 and 6.28, respectively).

The explanation of that could be related to the chicks strain (Avian versus Cobb) and due to growth promoter (Amio-Flash) supplementation resulted in improvements in BWG, FC, FCR and CCR compared with other treatments. These results are in agreement with those obtained by Awad *et al.* (2013) who showed that live body weight, body weight gain, feed consumption, feed conversion ratio and production index were significantly affected due to ducklings breed and growth promoters during the overall experimental period.

Similar observation were reported by other investigators Ghazalah, *et al.* (2007), Ahmed *et al.* (2014) and El Faham et al. (2015) in broiler and Torres *et al.* (2007) in Turkeys and Kumararaj *et al.* (1997) in quails. They concluded that feed additives such as probiotic, prebiotic and symbiotic act as growth promoters, immune stimulators, help in improving performance and production index.

Carcass traits:

Data in Tables (4 and 5) clarify carcass traits of broiler chicks as affected by strain, growth promoters supplementation and their interaction at 5 wks of age. Carcass, total edible parts, liver, heart and giblets percentages were significantly affected by strain. Avian strain had significantly higher Carcass and total edible parts percentages by 3.20 and 2.45%, respectively compared to Cobb strain. Conversely, Cobb strain had significantly higher liver, heart and giblets percentages than Avian strain.

No significant difference between experimental treatments for previously mentioned traits was detected. The corresponding values for carcass percentages ranged between 68.95 and 69.92%, while total edible parts (carcass weight + giblets weight) percentages ranged between 73.28 and 74.38% and giblets percentages ranged between 4.11 and 4.46%. These results were similar to Abd El-Gawad *et al* (2004); El-Yamny and Fadel (2004) and Abdel-Azeem and Hamid (2006) who observed that growth promoters had no significant differences among all groups in carcass weight and dressing percentage.

Carcass, total edible and heart percentages were significantly affected by the interaction between strain and growth promoters supplementation.

Blood plasma constituents:

Blood plasma constituents of broiler chicks as affected by strain, growth promoters supplementation and their interaction are presented in Table (6). It is evidently show all studies plasma constituents were significantly affected by strain except plasma albumen. Cobb chicks had significantly higher plasma total protein, globulin, cholesterol and AST by 14.06, 32.14, 12.61 and 24.59%, respectively as compared to Avian chicks at 5 wks of age.

In the same trend, the albumin/globulin (A/G) ratio that has been well known as an indicator for the metabolic activities and immune resistance was significantly the lowest for the Cobb chicks indicating more disease resistance and immune response. The high A/G ratio indicating the worst immune status (Lee et al., 2010). Moreover, the lowest values of A/G ratio were achieved for the given growth promoters ($T_{2,\ 3\ \text{and}\ 4}$), particularly those fed on diet contained Bio-Strong (1.30), Amino-Flash (1.76) and Bio-Feed (1.75) compared to control (2.26).

Cholesterol and AST were significantly increased in broiler chicks fed diets supplemented with Bio-Strong (T_3) as compared to those fed the control diet (T_1), whereas plasma AST and ALT values significantly decreased in broiler chicks fed diets supplemented with Bio-Feed (T_4).

The interaction between strain and growth promoter supplementation to broiler diets affect on all studied plasma constituents. It is worth to note that the chicks fed diets supplemented with Bio-strong in both stain during studied period (0-5 wks) reflected the lowest significant A/G ratio compared with the other treatments. However, A/G ratio decreased by 52.6% (1.35 versus 2.26) in Avian strain and decreased by 24.7% (1.25 versus 1.66) in Cobb strain compared with that fed control diets. Besides, the differences between the two treatments were significant. Plasma cholesterol and AST values were significantly increased and plasma ALT value was significantly decreased in Cobb chicks strain fed diets supplemented with Bio-strong as compared to those fed control diets. However, these findings are in agreement with those reported by Abdel-Azeem (2002), Abd El-Gawad *et al.* (2004) and Tolba *et al.* (2004a and b) they reported that broiler chicks fed on diets supplemented with biological feed additives showed higher values of total plasma protein, albumin and globulin, while lower values of A/G ratio. On the other hand, plasma albumen is very strong predictor of health so that low albumen is a sign of poor health, while blood globulin is an indicator for the immunity response and source of gamma globulins (Ahmed, 2006).

Economical efficiency:

Calculations of feeding economical efficiency were carried out according to the prices of feed ingredients, additives and live body weight prevailing during the experimental time as listed in Table (7). Economical efficiency was decreased by 11.27 and 40% for Avian broiler chicks, whereas it was improved by 22, 0, 0% for Cobb chicks fed diets supplemented with Amio-Flash, Bio-strong and Bio-Feed, respectively as compared to those fed the control group. This results may be due to improve feed conversion ratio and increase live body weight for Cobb broiler chicks fed diets supplemented with Amio-Flash as growth promoter during the overall experimental period (0-5 wks) of age.

CONCLUSION

In this study, the best performance was seen when Amino-Flash were incorporated in the broiler chicks. This would lead to concluded that Amio-Flash could be used as growth promoter in broiler diets without any adverse effects. Generally, Cobb chicks had superior performance (LBW, BWG, FI and PI) compared to the Avian strain, whereas Avian broiler had significant in carcass traits (carcass and total edible parts percentages).

Table (1): 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	6.50
Soybean Oil	2.00	4.00
Mono-Calcium Phosphate	1.80	1.60
Calcium Carbonate	1.60	1.50
Salt	0.20	0.20
MHA	0.20	0.20
HCL Lysine	0.20	0.20
Premix	0.30	0.30
Total	100	100
Chemical Composition		
Crude Protein %	23.00	21.24
ME Kcal/ Kg diet	2986	3179
Ca%	1.02	0.93
AP%	0.50	0.45
Lysine	1.29	1.17
Methionine & Cystein	0.95	0.91

MHA: 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

Table (2): Broiler performance as affected by strain, growth promoters supplementation and their interaction.

Item	Trait				
	Day old chick weight, g	**Body weight at 5 wks, g**	**Body weight gain, g**	**Growth rate**	**Performance Index**
Strain (S)					
Avian	44.03	1395.08	1351.05	187.70	71.95
Cobb	43.66	1420.31	1376.65	188.05	72.13
Treatment (T)					
Control (T1)	43.78	1422.42^{ab}	1378.64^{ab}	188.04	73.92^{ab}
Amio-Flash (T2)	43.42	1486.20^{a}	1442.77^{a}	188.64	77.87^{a}
Bio-Strong (T3)	44.01	1380.25^{b}	1336.24^{b}	187.64	69.29^{b}
Bio-Feed (T4)	44.16	1341.91^{b}	1297.75^{b}	187.18	67.09^{b}
Interaction effect					
Avian – T1	43.74	1461.00^{ab}	1417.26^{ab}	188.37	78.52^{a}
Avian – T2	43.22	1451.50^{ab}	1408.28^{ab}	188.42	77.17^{a}
Avian – T3	44.28	1375.50^{bc}	1331.22^{bc}	187.53	67.96^{ab}
Avian – T4	44.86	1292.31^{c}	1247.45^{c}	186.48	64.17^{b}
Cobb – T1	43.81	1383.83^{bc}	1340.02^{bc}	187.72	69.32^{ab}
Cobb – T2	43.62	1520.89^{a}	1477.27^{a}	188.86	78.57^{a}
Cobb – T3	43.74	1385.00^{bc}	1341.26^{bc}	187.74	70.62^{ab}
Cobb – T4	43.45	1391.50^{bc}	1348.05^{bc}	187.87	70.00^{ab}
Probability					
S	NS	NS	NS	NS	NS
T	NS	0.01	0.01	NS	0.02
S*T	NS	0.02	0.02	NS	0.05

a, b and c Means within the same column with different letters are significantly differed, NS= Non-significant.

Table (3): Feed consumption, feed conversion ratio, protein conversion ratio and calorie conversion ratio as affected by strain, growth promoters supplementation and their interaction.

Items	Trait			
	Feed consumption, g	**Feed conversion ratio**	**Protein conversion ratio (PCR)**	**Calorie conversion ratio (CCR)**
Strain (S)				
Avian	2627.63^{b}	1.95	0.43	6.08
Cobb	2705.57^{a}	1.97	0.43	6.05
Treatment (T)				
Control (T1)	2659.10^{ab}	1.93	0.42	5.93
Amio-Flash (T2)	2738.78^{a}	1.90	0.42	5.86
Bio-Strong (T3)	2663.68^{ab}	1.99	0.44	6.16
Bio-Feed (T4)	2604.84^{b}	2.02	0.45	6.31
Interaction effect				
Avian – T1	2636.94^{bc}	1.86	0.41	5.70
Avian – T2	2649.68^{bc}	1.88	0.41	5.84
Avian – T3	2695.62^{b}	2.02	0.45	6.28
Avian – T4	2528.28^{c}	2.04	0.46	6.28
Cobb – T1	2681.26^{b}	2.00	0.44	6.15
Cobb – T2	2827.87^{a}	1.91	0.42	5.88
Cobb – T3	2631.75^{bc}	1.96	0.43	6.04
Cobb – T4	2681.40^{b}	1.99	0.44	6.13
Probability				
S	0.02	NS	NS	NS
T	0.04	NS	NS	NS
S*T	0.01	NS	NS	NS

a, b and c Means within the same column with different letters are significantly differed, NS= Non-significant.

Table (4): Carcass traits of broiler chicks as affected by strain, growth promoters supplementation and their interaction at 5 wks of age.

Items	Trait				
	Live body weight, g	**Carcass weight, g**	**Carcass, %**	**Abdominal fat, %**	**Total edible parts, %**
Strain (S)					
Avian	1540.8[b]	1088	70.64[a]	1.25	74.72[a]
Cobb	1628.7[a]	1115	68.45[b]	1.09	72.93[b]
Treatment (T)					
Control (T1)	1504.2[b]	1051.5[b]	69.92	0.92	74.38
Amio-Flash (T2)	1630[a]	1134[ab]	69.62	1.15	73.73
Bio-Strong (T3)	1550.8[ab]	1068.5[ab]	68.95	1.23	73.28
Bio-Feed (T4)	1654.2[a]	1152[a]	69.69	1.39	73.90
Interaction effect					
Avian – T1	1486.7	1051	70.73[a]	0.88	75.05[a]
Avian – T2	1583.3	1120	70.82[a]	1.25	74.87[a]
Avian – T3	1495	1051	70.29[ab]	1.31	74.25[ab]
Avian – T4	1598.3	1129	70.71[a]	1.22	74.70[a]
Cobb – T1	1521.7	1052	69.10[abc]	0.97	73.70[ab]
Cobb – T2	1676.7	1148	68.42[bc]	1.04	72.59[b]
Cobb – T3	1606.7	1086	67.60[c]	1.14	72.31[b]
Cobb – T4	1710	1175	68.67[abc]	1.55	73.09[ab]
Probability					
S	0.04	NS	0.0003	NS	0.001
T	0.05	0.05	NS	NS	NS
S*T	NS	NS	0.02	NS	0.04

a, b and c Means within the same column with different letters are significantly differed, NS= Non-significant.
Total edible parts, % = Dressing (%) + Giblets (%).

Table (5): Giblets percentages of broiler chicks as affected by strain, growth promoters supplementation and their interaction at 5 wks of age.

Items	Trait			
	Liver, %	**Gizzard, %**	**Heart, %**	**Giblets, %**
Strain (S)				
Avian	2.19^{b}	1.42	0.48^{b}	4.08^{b}
Cobb	2.46^{a}	1.38	0.64^{a}	4.48^{a}
Treatment (T)				
Control (T1)	2.29	1.62	0.55	4.46
Amio-Flash (T2)	2.13	1.43	0.56	4.11
Bio-Strong (T3)	2.47	1.29	0.58	4.34
Bio-Feed (T4)	2.40	1.26	0.55	4.21
Interaction effect				
Avian – T1	2.14	1.74	0.43^{c}	4.32
Avian – T2	2.02	1.52	0.51^{bc}	4.06
Avian – T3	2.26	1.24	0.46^{c}	3.95
Avian – T4	2.32	1.16	0.51^{bc}	3.99
Cobb – T1	2.44	1.50	0.66^{a}	4.60
Cobb – T2	2.24	1.33	0.61^{ab}	4.17
Cobb – T3	2.68	1.35	0.70^{a}	4.72
Cobb – T4	2.47	1.37	0.59^{ab}	4.43
Probability				
S	0.02	NS	0.0001	0.01
T	NS	NS	NS	NS
S*T	NS	NS	0.001	NS

a, b and c Means within the same column with different letters are significantly differed, NS= Non-significant.
Giblets, % = Liver (%) + Heart (%) + Gizzard (%).

Table (6): Blood plasma constituents of broiler chicks as affected by strain, growth promoters supplementation and their interaction.

Items	Trait						
	Total Protein (g/ dl)	**Albumen (g/ dl)**	**Globulin (g/ dl)**	**A/G ratio**	**Cholesterol (mg/ dl)**	**AST**	**ALT**
Strain (S)							
Avian	6.40[b]	4.16	2.24[b]	2.03[a]	201.13[b]	33.96[b]	45.28[a]
Cobb	7.30[a]	4.33	2.96[a]	1.51[b]	226.50[a]	42.31[a]	34.16[b]
Treatment (T)							
Control (T1)	6.06[c]	4.11	1.95[c]	2.26[a]	196.25[c]	38.66[b]	42.02[ab]
Amio-Flash (T2)	6.68[bc]	4.17	2.51[b]	1.76[b]	201.50[bc]	38.64[b]	48.25[a]
Bio-Strong (T3)	7.79[a]	4.38	3.42[a]	1.30[c]	236.25[a]	41.66[a]	37.23[ab]
Bio-Feed (T4)	6.86[b]	4.33	2.53[b]	1.75[b]	221.25[ab]	33.60[c]	31.38[b]
Interaction effect							
Avian – T1	5.85[d]	4.31[bc]	1.54[d]	2.85[a]	196.67[d]	31.15[c]	46.02[ab]
Avian – T2	5.96[d]	3.97[bc]	1.99[cd]	2.04[b]	176.00[d]	32.83[c]	44.51[ab]
Avian – T3	6.70[bcd]	3.81[c]	2.89[b]	1.35[cd]	191.67[d]	38.72[b]	52.86[a]
Avian – T4	7.09[bc]	4.56[ab]	2.54[bc]	1.87[bc]	240.67[b]	33.15[c]	37.73[abc]
Cobb – T1	6.28[cd]	3.91[c]	2.37[bc]	1.66[bcd]	196.00[d]	46.16[a]	38.02[abc]
Cobb – T2	7.41[b]	4.38[abc]	3.03[b]	1.49[bcd]	227.00[bc]	44.45[a]	51.99[a]
Cobb – T3	8.88[a]	4.94[a]	3.94[a]	1.25[d]	281.00[a]	44.60[a]	21.60[c]
Cobb – T4	6.62[bcd]	4.10[bc]	2.52[bc]	1.63[bcd]	202.00[cd]	34.05[c]	25.04[bc]
Probability							
S	0.002	NS	0.001	0.001	0.002	0.0001	0.03
T	0.001	NS	0.0002	0.001	0.002	0.0001	0.05
S*T	0.0003	0.01	0.0002	0.0004	0.0001	0.0001	0.03

a,b, c and d Means within the same column with different letters are significantly differed, NS= Non-significant.

Table (7): Economic traits of broiler chicks as affected by strain, growth promoters supplementation and their interaction.

Trait	Strain	Treatment			
		Control	Amio-Flash	Bio-Strong	Bio-Feed
Average Feed Consumption / Bird (Kg)	Avian	2.64	2.65	2.70	2.53
	Cobb	2.68	2.84	2.63	2.68
Feed Cost (LE)	Avian	10.08	10.37	10.52	9.73
	Cobb	10.25	11.11	10.27	10.32
Live Body Weight (Kg)	Avian	1.46	1.45	1.38	1.29
	Cobb	1.38	1.52	1.39	1.39
Total Cost (LE)*	Avian	15.08	15.37	15.52	14.73
	Cobb	15.25	16.11	15.27	15.32
Total Return (LE)*	Avian	19.72	19.60	18.57	17.45
	Cobb	18.68	20.53	18.70	18.79
Net Return (LE)	Avian	4.64	4.23	3.05	2.72
	Cobb	3.43	4.42	3.43	3.47
Economic Efficiency	Avian	30.79	27.42	19.61	18.47
	Cobb	22.58	27.46	22.42	22.62
Relative Economic Efficiency	Avian	100	89	73	60
	Cobb	100	122	100	100

* According to the local price of Kg LBW which was 13.50 L.E.
Total cost= feed cost + fixed cost (price of chicks + labor, medication, electricity, etc. (5.0 L.E.)

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الملخص العربى

إستجابة سلالات بدارى التسمين لبعض منشطات النمو والتداخل بينهما على الأداء، صفات الذبيحة ومكونات بلازما الدم

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أستخدم فى هذه التجربة عدد ٢٤٠ كتكوت تسمين عمر يوم لكل من سلالتى (Avian، Cobb). تم وزن وتقسيم كتاكيت كل سلالة عشوائيا إلى أربع مجاميع تجريبية بكل مجموعة ثلاث مكررات متساوية (١٠ كتاكيت لكل سلالة) وذلك لدراسة إستجابة سلالات بدارى التسمين لإضافة بعض منشطات النمو الطبيعية (Amio-Flash, Bio-strong and Bio-Feed) على الأداء الإنتاجى، صفات الذبيحة، وبعض مكونات بلازما الدم بالإضافة الى الكفاءة الإقتصادية. وأشارت النتائج الى الأتى:

- إستهلكت كتاكيت سلالة الكوب كمية علف أكثر معنويا بالمقارنة بكتاكيت سلالة الإفيان. وسجلت الكتاكيت المغذاة على Amio-Flash أعلى قيم بالنسبة لوزن الجسم الحى، الزيادة فى وزن الجسم، معامل الأداء أو الإنتاج والإستهلاكالغذائى. أيضا سجلت أفضل قيمة بالنسبة لكل من معامل التحويل الغذائى، كفاءة الإستفادة من البروتين والطاقة وذلك بالمقارنة بتلك المغذاة على العلائق التجريبية الاخرى. وجد أن التداخل بين السلالة وإضافة منشطات النمو له تأثير معنوى على وزن الجسم الحى، الزيادة فى وزن الجسم، ومعامل الأداء والإستهلاك الغائى.
- نسب كل من الذبيحة ومجموع الأجزاء المأكولة كانت أعلى معنويا بالنسبة لكتاكيت سلالة الإفيان مقارنة بسلالة الكوب.
- كتاكيت سلالة الكوب كانت أعلى معنويا من حيث البروتين الكلى بالبلازما، الجلوبيولين، وإنزيمات الكبد (AST) مقارنة بكتاكيت سلالة الإفيان. أيضا، زاد الكوليسترول وإنخفضت نسبة A/G ratioمعنويا بإضافة منشطات النمو المختلفة بالمقارنة بمعاملة الكنترول. كان هناك تأثير معنوى للتداخل بين السلالة وإضافة منشطات النمو على جميع مكونات البلازما.
- تحسنت الكفاءة الإقتصادية لكتاكيت سلالة الكوب فقط بالتغذية على علائق مضاف إليها Amio-Flash بالمقارنة بعليقة الكنترول.هذه النتائج تشير الى أنه يمكن إضافة Amio-Flash كمنشط نمو طبيعى لعلائق سلالة الكوب وذلك لتحسين الأداء الإنتاجى والكفاءة الإقتصادية بدون التأثير على صفات الذبيحة خلال الفترة من (الفقس حتى عمر ٥ أسابيع).