Egypt. Poult. Sci. Vol (35) (II): (471 - 488) (2015) **(1572)**

Egyptian Poultry Science Journal

http://www.epsaegypt.com

ISSN: 1110-5623 (Print) – 2090-0570 (On line)

IMPACT OF STRAIN, DIFFERENT LEVELS OF COMMERCIAL MULTI ENZYMES AND THEIR INTERACTION ON BROILERS PERFORMANCE AND CARCASS TRAITS

G.N. Rayan, A.I. El-Faham and M.A.M. Abdelaziz
Dept. of Poult. Produ. , Fac. of Agric., Ain Shams Univ., Cairo, Egypt.

Received: 22/04/2015 Accepted: 15/05/2015

ABSTRACT: The present study aimed to evaluate the effect of strain (Avian and Cobb), different levels of commercial multi enzymes (Phytabex Plus) and their interaction on broilers performance, carcass traits and economic efficiency. A total of 180 day-old broilers chicks (90 Cobb and 90 Avian strain) were used in this experiment. Chicks within each strain were fed three experimental diets; one of them was used as a control diet, the other two groups were fed the same basal diets supplemented with commercial multi enzymes (100 and 200 g/ton). Results indicated that live body weight at 3 wks of age was significantly affected by strain, different levels of enzymes and their interaction. Cobb chicks were significantly heavier body weight compared to Avian strain. Chicks fed diets supplemented with multi enzymes (100 and 200 g/ton) had heavier body weight compared to those fed control diet at 3 wks of age. Daily feed consumption was significantly affected by interaction between strain and enzymes. The Avian strain had significantly higher carcass weight, dressing percentage and relative edible meat parts compared to Cobb strain. While, Cobb chicks had significantly higher heart percentage in comparison with Avian chicks. On the other hand, dressing and gizzard percentages were significantly affected by interaction between strain and enzymes. Avian strain had significantly higher relative abdominal fat weight compared to Cobb strain. Broilers at marketing age (5 wks) fed diets supplemented with multi enzymes (100 and 200 g/ton) had lower abdominal fat percentage compared to those fed control diet. In this study, breast percentage of broiler strains fed control diet represented only 92.5 % of that fed diet supplemented with multi enzymes (200 g/ton). Consequently, enzymes additives in broilers diets lead to increased breast meat by 7.5 %. Cobb strain has superiority and genetically potency for productive and economic efficiency than Avian strain. Supplementation of commercial multi enzymes in Cobb broiler diets by 200 g/ton had the best economical and relative efficiency values.

Key Words: Strain, Enzymes, Broilers, Carcass traits and Economic efficiency.

Corresponding author: Gamal_Rayan@agr.asu.edu.eg

INTRODUCTION

The rapid growth of modern broiler is now developed for the poultry industry in the last years accompanied by increased carcass and abdominal fat that demanded the evaluation of different commercial broiler of concern to the consumer and the processor (Sizemore and Barbato, 2002).

Development commercial poultry has become more complex and challenging because a wide range of objectives need to be considered simultaneously in order to reduce production costs, whilst improving health, welfare, and product quality. Consequently, breeding goals must include increased growth rate, breast muscle yield, decreased abdominal fat, improved development of the skeletal system and overall fitness (Li et al., 2005). Abdominal and subcutaneous fat are being regarded as the main source of waste in the slaughterhouse. Because of abdominal fat was highly correlated (0.6 to 0.9) with total carcass lipids, it is used as main criterion reflecting excessive fat deposition in broilers (Chambers, 1990). Therefore, the success of poultry meat production has been strongly related to the improvements in growth and carcass yield, mainly by increasing breast proportion and reducing abdominal fat. Nowadays, recent nutritional strategies with ultimate goal of feed cost reduction led to production of fatty broiler carcasses (Ademola *et al.,* 2009).

On the other hand, commercial strains of broilers are genetically capable to attain high rates of rapid growth at maximum feed conversion. This tremendous potential cannot be fully expressed unless the broiler rations are nutritionally adequate and the conditions in the intestinal tract promote the maximum digestion and absorption of nutrients. Unless this genetic potential is full expressed, broilers performance stand to suffer reduced. Natural commercial products such as exogenous enzymes and other products may be used to improve and maximize the genetic potential of broilers regarding feed efficiency, weight gain and carcass characteristics (Khattak *et al.,* 2006 and Nadeem *et al.,* 2005).

Furthermore, there has been increased interest in quantitatively studying, the effect of different enzyme preparations when added to a cereal based diets, low protein diet or low energy diet on performance, carcass characteristics and economic efficiency of chickens (Attia *et al.,* 2001; El-Faham and Ibrahim, 2004; Ghazalah *et al.,* 2005). It has been demonstrated that the supplementation of poultry diets with enzymes frequently exerts beneficial effects. The extent of the benefit depends on a number of factors such as the nature of the dietary components, whether or not the diets have been processed, whether the appropriate enzyme have been included for the substrates contained in the diets and specific factors.

The role of the different enzymatic complexes available in the market can differ. This is due to specific factors inherent to the specific condition of enzymes production, such as: type and strain of the microorganisms, culture medium used, fermentation conditions and processing, process and quality control and others (Gilbert and Cooney, 2011). The enzymatic supplement should be added in amounts proportional to the substrate that will interact (Thi, 2008). When these criteria are not met, the results can be controversial.

The economic analysis is essential, since the inclusion of additives can increase the costs in formulating the diets (Araujo *et al*., 2007). The use of enzymes has shown financial benefits to the extent that it is considered the possibility of greater use of nutrients, mainly when alternative feedstuffs are employed, with lower cost and lower digestibility (Strada *et al*., 2005; Costa *et al*., 2008).

Phytabex Plus is one of multi-enzymes product which contains Xylanase, Cellulase, β-Glucanase, β-Mannanase, Phytase, Acid Protease and α-Amylase enzymes and is approved for use in poultry diets. Little information is available regarding the relationship between Phytabex Plus as enzyme product and broiler chicken strains (Cobb and Avian) fed corn –soya based diets. The objective of this study was to evaluate the effects of strain and different Levels of enzyme on broilers productive performance carcass characteristics and economic efficiency.

MATERIALS AND METHODS

A total of 180 day-old broilers chicks (90 Cobb and 90 Avian strain) were used in this experiment. Chicks within each strain were fed three experimental diets; one of them was used as a control diet, the other two groups were fed the same basal diets supplemented with commercial multi enzymes (100 and 200 g/ton). Therefore, there were 6 experimental treatments in which each treatment was 2 replicated each having 15 chicks, distributed in a randomized experimental design. They were housed in floor pens under the same environmental, managerial and hygienic conditions from one day old to the end of the experiment (5 wks of age). Composition of commercial multi enzymes (Phytabex Plus): each 1 kg contains (Xylanase 10000000 IU, Cellulase 500000 IU, β-Glucanase 500000 IU, β-Mannanase 800000 IU, Phytase 5500000 IU, Acid Protease 2000000 IU, α-Amylase 100000). Corn starch food grade (carrier) up to 1 kg.

The feed and water were provided *ad libitum*. All diets were formulated to provide the nutrient requirements according to NRC (1994). Composition of the experimental diets is summarized in Table (1).

Growth performance measurements: Individual live body weight was recorded within each of broiler strains at 5 wks of age. Daily weight gain, feed consumption in gram and feed conversion ratio during period (0-5 wks) of age was determined.

Carcass measurements: At 5 wks of age, 18 hens (9 from each strain) were randomly taken and slaughtered for carcass evaluation. They were slaughtered after weighing. The birds were eviscerated by removing the viscera. The giblets (gizzard, liver and heart) were dissected from the viscera and the gizzard was cut, open and its contents cleaned. The carcass, thigh, drumstick and breast muscles, wing and abdominal fat were weighed. All parts were expressed as a proportion of the live body weight. Also, dressing percentage and edible meat parts (%) were calculated.

Economic evaluation: The economic efficiency traits were calculated from the input / output analysis according to the price of experimental diets and live body weight of chickens in local market at the time of the experiment.

Performance index (PI) was calculated according to North (1981) as follows:

PI = (Live body weight (Kg) / FCR) ×100

Production efficiency factor (PEF) was calculated according to Emmert (2000) as follows:

PEF = [Livability × Mass (Kg) / FCR × Age in days] × 100

Where:

Livability = 100 – Mortality rate (%), Mass (Kg) = Total final live body weight.

Statistical analysis: Data were analyzed using two-way analysis of variance for strain and enzymes and their interaction using the General Linear Model (GLM) procedure of SAS (2002) as following model;

$Y_{ijk} = \mu + S_i + T_j + (S\ T)_{ij} + e_{ijk}$

Y_{ijk} = Trait measured,

μ= Overall mean,

S_i = Strain effect (i= 1, 2),

T_j = Enzymes effect (j= 1, 2 and 3),

$(S\ T)_{ij}$ = Interaction between strain and enzymes,

e_{ijk} = Experimental error.

When significant differences among means were found, means were separated using Duncan's multiple range tests.

RESULTS AND DISCUSSION

Growth performance: Effect of strain (Cobb & Avian) and different levels of multi enzymes (Phytabex Plus; 100 and 200 g/ton) on live body weight of broiler chicks at 3 and 5 wks of age are shown in Figures (1 and 2). The present results indicate that live body weight at 3 weeks of age was significantly affected by strain, enzymes and their interaction. Cobb chicks were significantly heavier body weight compared to Avian chicks. Chicks fed diets supplemented with multi enzymes (100 and 200 g/ton) recorded a heavier body weight compared to those fed control diet at 3 wks of age. At 5 wks of age, no significant difference ($P \geq 0.05$) was observed in live body weight between broilers strains, multi enzymes and their interaction. Deif (2008) showed that there was no significant difference between Hubbard and Cobb broiler chicks for body weight at marketing age. Marcato et al. (2009) found similar growth rates for Cobb and Ross breeds, both presented the inflection point of the growth curve at 35 days old.

Data presented in Table (2) clarifies daily weight gain, daily feed consumption and feed conversion ratio during (0-5 wks) of age as affected by strain and different levels of multi enzymes and their interaction. Although, no significant difference ($P \geq 0.05$) between broilers strains, enzymes and their interaction for daily weight gain and feed conversion ratio were found. In the present study observed that chickens fed diet supplemented with multi enzymes (200 g/ton) had higher daily weight gain (39.15g) than chickens fed control diet and 100 g/ton (37.65 and 37.65 g, respectively). Cobb strain had better feed conversion ratio (1.97) compared to Avian strain (2.00).

Chicks fed diets (control and 200 g multi enzymes /ton) had better feed conversion ratio (1.93 and 1.97, respectively) than those fed diet supplemented with multi enzymes 100 g/ton (2.06).

No significant difference (P ≥0.05) between strains for daily feed consumption was detected. In this concern, Al-Rishan (2006) found that there was no significant difference (P ≥0.05) among Hubbard, Ross and Arbor Acres strains for feed consumption and feed conversion ratio. The treatments showed significant differences in daily feed consumption for different levels of enzymes. Chicks fed diets supplemented with multi enzymes (100 and 200 g/ton) consumed significantly more feed (76.05 and 76.96 g, respectively) than chicks fed control diet (72.70 g). Daily feed consumption was significantly affected by interaction (S*T) between strain and different levels of enzymes. That means the expression of this trait was different based on strain and level of enzyme added to the diet.

The results of this experiment are in agreement with several studies that reported no improvement in feed conversion ratio or body weight gain when mixed-enzyme preparation was added to the broiler fed on corn-soybean diets (Kocher et al., 2002; Meng et al., 2006; Walk et al., 2011; Barekatain et al., 2013). On the other hand, some reports indicated that dietary enzymes have beneficial effects on broiler productivity when chicks fed corn-soybean based diets (Kocher et al., 2003; Cowieson et al., 2006).

Carcass traits: Data presented in Table (3) show chicks body weight and relative edible meat parts weight at 5 wks of age as affected by strain and different levels multi enzymes and their interaction.

Significant difference between strains was detected for carcass weight, dressing percentage, heart and edible meat parts percentages. It could be observed that the Avian strain had significantly higher carcass weight, dressing percentage and relative edible meat parts compared to Cobb strain. While, Cobb broiler chicks had significantly higher heart percentage (0.64 %) in comparison with Avian broiler chickens (0.52 %). Ojedapo, *et al.* (2008) pointed that the strain and sex had a significant effect on the carcass characteristics. No significant difference between different levels of enzymes for body weight and all relative edible meat parts weight were found. In this concern, Gracia et al. (2003) and Saleh et al. (2005) reported that internal organs were not affected by the enzymes supplementation. In the present study, dressing and gizzard percentages were significantly affected by interaction between strain and multi enzymes.

Concerning abdominal fat percentage, Avian strain was significantly higher relative abdominal fat compared to Cobb strain (Fig. 3). In this concern, Vieira and Moran Jr. (1998) evaluated the carcass yield of four different breeds at 49 day old chickens, they found no difference in the yield, but differences of up to 20% in the amount of abdominal fat were verified between different commercial breeds. AL-Rishan (2006) found that the Arbor Acers and Hubbard broiler chicks were significantly higher abdominal fat percentage compared to Ross one.

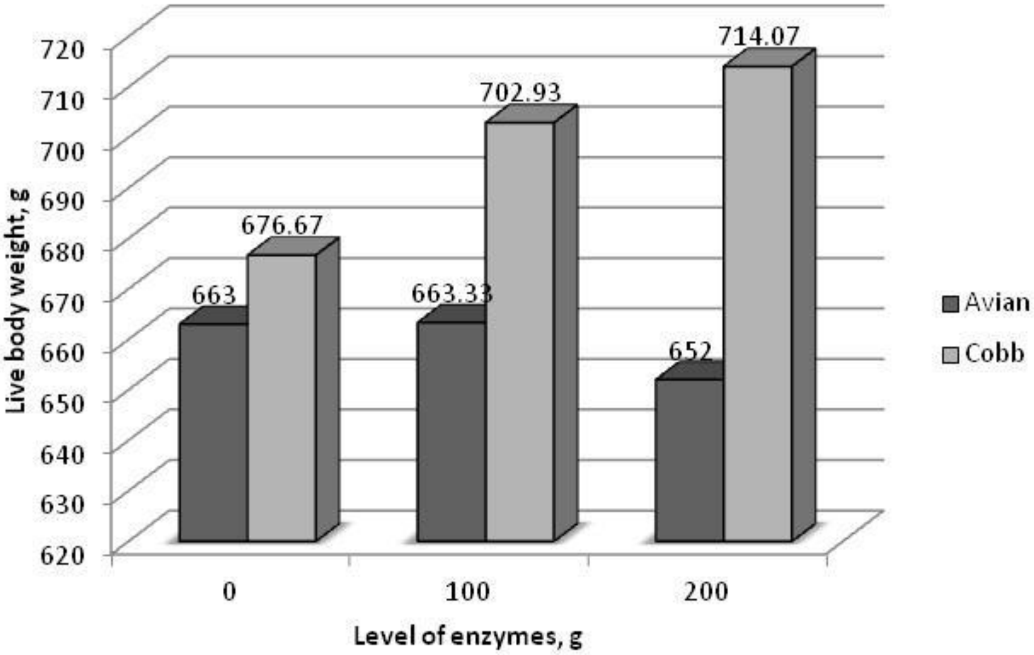
Broilers at 5 wks of age fed diets supplemented with multi enzymes (100 and 200 g/ton) had a lower abdominal fat percentage compared to those fed control diet (Fig. 3). Chambers (1990) reported that abdominal and subcutaneous fat are being regarded as the main source of waste in the slaughterhouse. Therefore, the success of poultry meat production has been strongly related to the improvements of growth and carcass yield, mainly by increasing breast percentage and reducing abdominal fat.

Percentages of breast, drum stick, thigh and wing at 35 days of age as affected by strain and different levels of multi enzymes and their interaction are presented in Table (4). It could be observed that breast percentage of chickens fed control diet represented only 82 % of that fed diet supplemented with multi enzymes (200 g/ton) of Avian broiler strain. Consequently, enzyme addition in Avian broilers diets lead to increased breast meat by 18 %. On the other hand, Breast percentages of Cobb broilers strain declined with increasing of enzymes level in diets, but these differences were not statistically significant. Generally, breast percentage of broiler strains fed control diet represented only 92.5 % of that fed diet supplemented with multi enzymes (200 g/ton). Consequently, enzymes additives in broilers diets lead to increased breast meat by 7.5 %.

Economic efficiency: The profitability of applying the current experimental treatments in broiler feeding depends on a great extent of both feed expenses and economic competence as presented in Table (5). Concerning feed cost, it is generally observed that birds fed diets supplemented with levels of enzymes (100 and 200 g/ton) have been costly compared to those fed control diet (non-addition enzymes) for both Avian and Cobb strains.

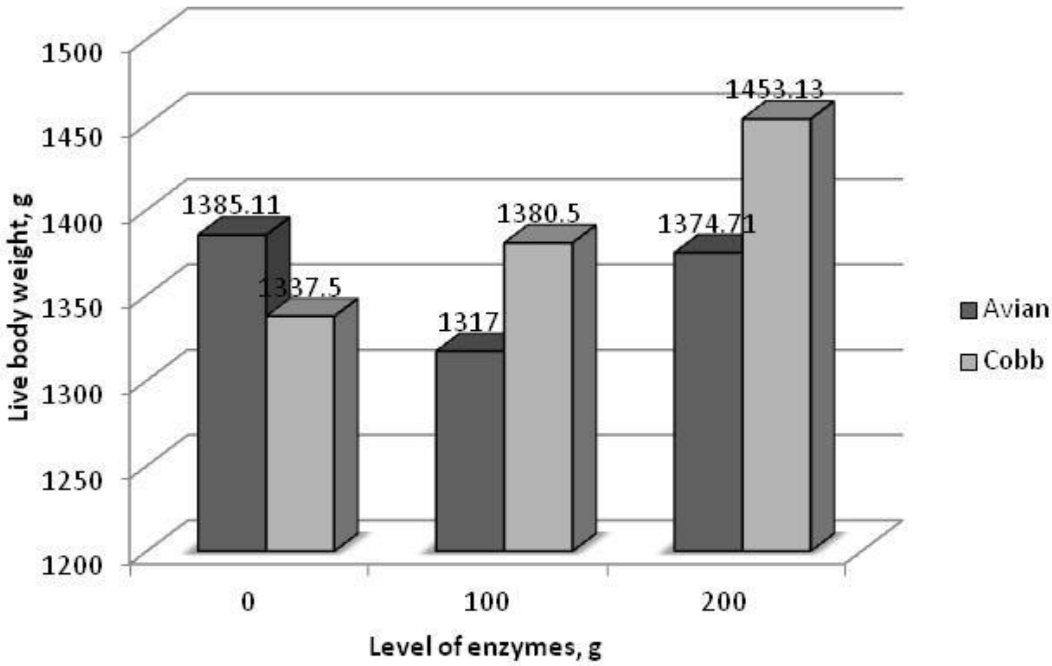
However, the overall means of economic traits for both strains (Avian and Cobb) showed higher difference. As shown in Table (5), although the both strains were in the same age (5 wks), but Cobb gave higher figures than Avian. The corresponding values of economic traits were (1.36 versus 1.39), (9.53 versus 9.72), (18.35 versus 18.77), (3.81 versus 4.05) and (26.44 versus 27.50) for live body weight, feed cost, total cost, net return and economic efficiency. Cobb strain has superiority and genetic potential for productive performance and economic efficiency than Avian strain. On the other hand, commercial multi enzymes (Phytabex Plus) supplementation in Cobb broiler diets at level of 200 g/ton had the best economical and relative efficiency values being 28.66 and 102.90, respectively (this may be due to live body weight and net return) as compared with control diet. Whereas, Avian chicks fed diet contained 100 g/ton Phytabex Plus had the lowest corresponding value being 21.86 and 74 %, respectively.

Conclusion: It could be concluded that, adding commercial multi enzyme (100 and 200 g/ton) to broiler diets, had no effect on body weight gain, even though it could reduced the abdominal fat percentage which means improvements of carcass yield. Therefore, the Avian chicks had significantly higher carcass traits compared to Cobb chicks. In this study, Breast percentage of broiler strains fed control diet represented only 92.5 % of that fed diet supplemented with multi enzymes (200 g/ton). Consequently, enzymes additives in broilers diets lead to increased breast meat by 7.5 %. Concerning economic evaluation, Cobb broiler diets with 200 g/ton commercial multi enzymes were the best, while Avian broiler diets with 100 g/ton multi enzymes resulted in the worst values.



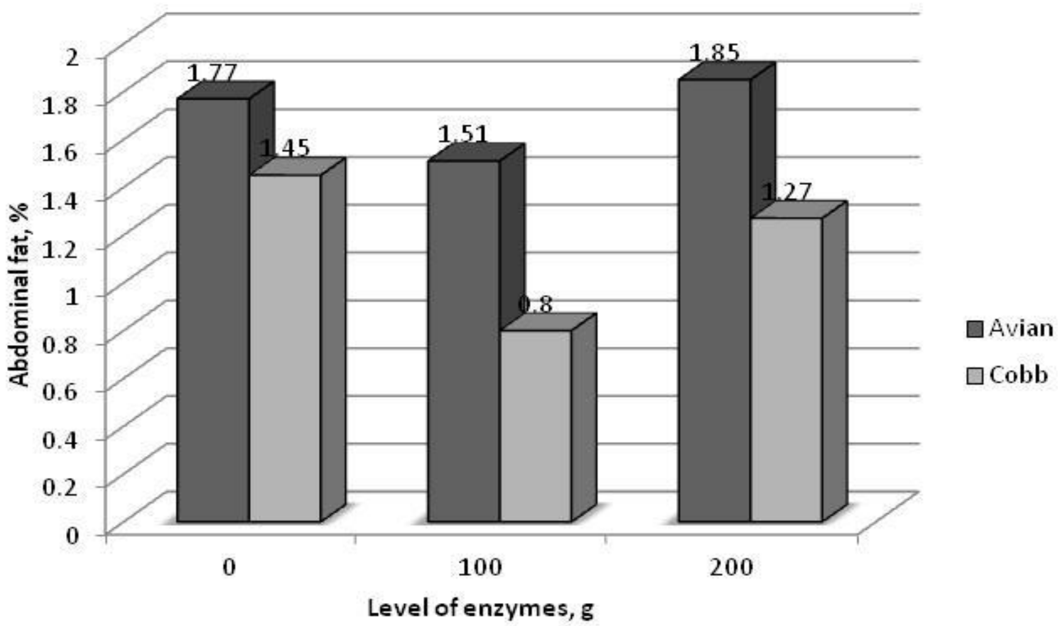
	Prob.		
	S	T	S*T
Live body weight, g	0.0001	0.01	0.0001

Fig. 1. Effect of strain and different levels of multi enzymes on live body weight of broiler strains at **3** wks of age.



	Prob.		
	S	T	S*T
Live body weight, g	NS	NS	NS

Fig. 2. Effect of strain and different levels of multi enzymes on live body weight of broiler strains at **5** wks of age.



	Prob.		
	S	T	S*T
Abdominal fat, %	0.005	0.05	NS

Fig. 3. Effect of strain and different levels of multi enzymes on abdominal fat percentage of broiler strains at 5 wks of age.

Table (1): Ingredients and proximate analyses of the experimental diets:

Ingredients (kg)	Starter diet [0-3 weeks]	Grower diet [4-5 weeks]
Yellow Corn (grains)	55.00	58.30
Soybean Meal (44%)	33.00	28.00
Poultry By-Product Meal (58%)	6.60	6.60
Soybean Oil	2.00	4.00
Di-Ca P	1.50	1.30
Limestone	1.00	0.90
NaCl	0.20	0.20
Premix*	0.30	0.30
MHA	0.20	0.20
L-Lysine HCl	0.20	0.20
Total	100	100
Calculated analysis		
Crude Protein %	23.16	21.24
ME Kcal/ Kg diet	2966	3159
Ca%	1.01	0.92
NPP%	0.50	0.46
Lysine	1.43	1.31
Methionine & Cystein	0.92	0.87

Di-Ca P: di-calcium phosphate, MHA: Methionine Hydroxy-Analogue, ME: metabolizable energy, NPP: non-phytate phosphorus.

Each 3 Kg of premix contains: Vitamins: A (retinyle acetate): 3600 mg; D3 (cholecalciferol): 50 mg; E (tocopherol acetate): 10000 mg; K_3 (menadione sodium bisulphite): 2000 mg; B_1 (thiamine mononitrate): 1000 mg; B_2 (riboflavin): 5000 mg; B_5 (calcium pantothenate): 10000 mg; B_6 (pyridoxine HCl): 1500 mg; B_{12} (cyanocobalamin): 10 mg; Biotin: 50 mg; Coline chloride: 250000 mg; Nicotinic acid: 30000 mg; Folic acid: 1000 mg; Minerals: Mn (manganese sulphate): 60000 mg; Zn (zinc sulphate): 50000 mg; Fe (ferrous carbonate): 30000 mg; Cu (copper sulphate): 10000 mg; I (calcium iodate): 1000 mg; Se (sodium selenite): 100 mg and Co (cobalt carbonate): 100 mg.

Table (2): Daily weight gain, daily feed consumption and feed conversion ratio during (0-5 wks) of age as affected by strain, enzyme levels and their interaction (Means ± SE).

Trait	Strain (S)	Treatment (T) PhytaBex Plus enzyme			Overall
		0 g / Ton	100 g / Ton	200 g / Ton	
Daily weight gain, g	Avian	38.32 ± 0.12	36.38 ± 2.92	38.03 ± 1.21	**37.58**
	Cobb	36.98 ± 0.29	38.21 ± 0.11	40.28 ± 0.05	**38.49**
	Overall	**37.65**	**37.29**	**39.15**	
Daily feed consumption, g	Avian	73.86 ± 0.62	75.43 ± 2.37	74.26 ± 0.49	**74.52**
	Cobb	71.53 ± 0.30	76.67 ± 0.13	79.66 ± 0.09	**75.95**
	Overall	**72.70[b]**	**76.05[a]**	**76.96[a]**	
Feed conversion ratio	Avian	1.93 ± 0.01	2.11 ± 0.24	1.96 ± 0.08	**2.00**
	Cobb	1.92 ± 0.01	2.01 ± 0.01	1.98 ± 0.01	**1.97**
	Overall	**1.93**	**2.06**	**1.97**	
Prob.					
	S	**T**	**S*T**		
Daily weight gain, g	NS	NS	NS		
Daily feed consumption, g	NS	0.003	0.01		
Feed conversion ratio	NS	NS	NS		

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

Table (3): Body weight and relative edible meat parts weight at 35 days of broilers age as affected by strain, enzyme levels and their interaction (Means ± SE).

Trait	Strain (S)	Treatment (T) PhytaBex Plus enzyme 0 g / Ton	100 g / Ton	200 g / Ton	Overall
Live body weight, g	Avian	1561.67 ±49.10	1628.33 ± 34.92	1580.00 ±71.47	**1590.00**
	Cobb	1473.33 ±69.36	1571.67 ±58.12	1540.00 ±20.00	**1528.33**
	Overall	**1517.50**	**1600.00**	**1560.00**	
Carcass weight, g	Avian	1097.33 ±36.78	1151.00 ±32.08	1134.00 ±40.10	**1127.44[a]**
	Cobb	1034.67 ±60.14	1047.67 ±28.62	1043.67 ±26.40	**1042.00[b]**
	Overall	**1066.00**	**1099.33**	**1088.83**	
Dressing, %	Avian	70.22 ±0.27	70.66 ±0.82	71.84 ±0.80	**70.91[a]**
	Cobb	70.14 ±0.84	66.70 ±0.83	67.73 ±0.93	**68.19[b]**
	Overall	**70.18**	**68.68**	**69.79**	
Liver, %	Avian	2.39 ±0.11	2.25 ±0.11	2.39 ±0.21	**2.34**
	Cobb	2.38 ±0.22	2.69 ±0.11	2.49 ±0.10	**2.52**
	Overall	**2.39**	**2.47**	**2.44**	
Gizzard, %	Avian	1.29 ±0.05	1.12 ±0.04	1.06 ±0.06	**1.16**
	Cobb	1.07 ±0.03	1.25 ±0.05	1.29 ±0.06	**1.20**
	Overall	**1.18**	**1.19**	**1.17**	
Heart, %	Avian	0.55 ±0.05	0.52 ±0.03	0.48 ±0.07	**0.52[b]**
	Cobb	0.68 ±0.09	0.65 ±0.05	0.59 ±0.01	**0.64[a]**
	Overall	**0.61**	**0.59**	**0.53**	
Giblets, %	Avian	4.22 ±0.15	3.89 ±0.17	3.94 ±0.31	**4.02**
	Cobb	4.13 ±0.32	4.60 ±0.09	4.36 ±0.07	**4.36**
	Overall	**4.18**	**4.25**	**4.15**	
Edible meat parts,%	Avian	74.45 ±0.41	74.55 ±0.95	75.77 ±1.08	**74.93[a]**
	Cobb	74.28 ±1.13	71.30 ±0.83	72.09 ±0.89	**72.56[b]**
	Overall	**74.37**	**72.92**	**73.93**	

Prob.	S	T	S*T
Live body weight, g	NS	NS	NS
Carcass weight, g	0.02	NS	NS
Dressing, %	0.001	NS	0.04
Liver, %	NS	NS	NS
Gizzard, %	NS	NS	0.002
Heart, %	0.02	NS	NS
Giblets, %	NS	NS	NS
Edible meat parts,%	0.01	NS	NS

a and b Means within the same main effects with different letters are significantly differed, NS= Non-significant. Giblets, % = Liver (%) + Heart (%) + Gizzard (%), Edible meat parts, % = Dressing (%) + Giblets (%).

Table (4): Percentages of breast, drum stick, thigh and wing at 35 days of broilers age as affected by strain and enzyme levels and their interaction (Means ± SE).

Trait	Strain (S)	**Treatment (T)** PhytaBex Plus enzyme			Overall
		0 g / Ton	100 g / Ton	200 g / Ton	
Breast, %	Avian	42.99 ± 6.22	49.70 ± 1.83	52.42 ± 2.81	**48.37**
	Cobb	49.64 ±1.56	48.09 ±0.74	47.72 ±0.37	**48.49**
	Overall	**46.32**	**48.90**	**50.07**	
Drum stick, %	Avian	13.22 ±0.30	12.59 ±0.77	13.12 ±0.40	**12.98**
	Cobb	13.98 ±1.13	13.67 ±0.28	13.87 ±0.40	**13.84**
	Overall	**13.60**	**13.13**	**13.50**	
Thigh, %	Avian	27.27 ±0.06	27.58 ±1.07	27.89 ±0.31	**27.58**
	Cobb	27.30 ±1.37	26.92 ±1.18	27.22 ±0.50	**27.15**
	Overall	**27.29**	**27.25**	**27.56**	
Wing, %	Avian	10.36 ±0.69	10.22 ±0.34	10.01 ±0.19	**10.20**
	Cobb	10.20 ±0.31	11.09 ±0.25	11.30 ±0.41	**10.86**
	Overall	**10.28**	**10.65**	**10.66**	

	Prob.		
	S	**T**	**S*T**
Breast, %	NS	NS	NS
Drum stick, %	NS	NS	NS
Thigh, %	NS	NS	NS
Wing, %	NS	NS	NS

NS= Non-significant.

Table (5): Effect of dietary treatments on economical efficiency.

Strains	**Avian**			**Cobb**		
Treatments	**0 g / Ton**	**100 g / Ton**	**200 g / Ton**	**0 g / Ton**	**100 g / Ton**	**200 g / Ton**
Average Feed Intake (Kg)	2.59	2.64	2.60	2.50	2.68	2.78
Feed Cost (LE)	9.40	9.65	9.55	9.10	9.81	10.25
Live Body Weight (Kg)	1.39	1.31	1.37	1.34	1.38	1.45
Total Cost (LE)*	14.39	14.65	14.55	14.10	14.81	15.25
Total Return (LE)*	18.70	17.78	18.56	18.06	18.63	19.62
Net Return (LE)	4.30	3.13	4.00	3.95	3.83	4.37
Economic Efficiency	29.89	21.86	27.56	28.01	25.83	28.66
Relative Economic Efficiency	100	74	93	100	92	102
Performance Index [1]	71.87	65.06	70.60	69.14	68.79	73.48
Production Efficiency Factor [2]	95.76	127.50	137.69	197.55	183.39	160.88

1: **North (1981)**, 2: **Emmert (2000),** * 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.).

REFERENCES

Ademola, S.G., G.O. Farinu and G.M. Babatunde (2009). Serum lipid, growth and haematological parameters of broilers fed garlic, ginger and their mixtures. World J. of Agric. Sci., 5: 99-104.

AL-Rishan, S.S. (2006). Productive performance and immunecompetence of some broiler strains under summer seasons conditions. M.Sc. Thesis, Ain shams university, Cairo, Egypt.

Araujo, J.A., J.H.V. Silva, A.L.L. Amancio, M.R. Lima and C.B. Lima (2007). Use of additives for avian feeding. Acta Vet. Bras., 1: 69-77.

Attia, Y.A., S.A. Abd El-Rahman and E.M.A. Qota (2001). Effects of microbial phytase with or without cell-wall splitting enzymes on the performance of broilers fed suboptimum levels of dietary protein and metabolisable energy. Egypt. Poult. Sci. J. 21:521-547.

Barekatain,M.R., C. Antipatis, M. Choct and P.A. Iji (2013). Interaction between protease and xylanase in broiler chicken diets containing sorghum distillers' dried grains with solubles. Anim. Feed Sci. Technol., 182: 71-81.

Chambers, J. R. (1990). Genetics of growth and meat production in chickens. Pages 599–643 in Quantitative Genetics and Selection. R. D. Crawford, ed. Poultry Breeding and Genetics. Elsevier, Amsterdam.

Costa, F.G.P., C.C. Goulart, D.F. Figueiredo, C.F.S. Oliveira and J.H.V. Silva (2008). Economic and environmental impact of using exogenous enzymes on poultry feeding. Int. J. Poult. Sci., 7: 311-314.

Cowieson, A.J., D.N. Singh and O. Adeola, (2006). Prediction of ingredient quality and the effect of a combination of xylanase, amylase, protease and phytase in the diets of broiler chicks. 1. Growth performance and digestible nutrient intake. Br. Poult. Sci., 47: 477-489.

Deif, A.S. (2008). A study on the immunogenetic profile of broiler strains fed on marginal high protein diets. Ph.D. Thesis, Ain shams university, Cairo, Egypt.

El-Faham, A.I. and M.T. Ibrahim (2004). Effect of enzyme supplementation on performance meat quality and economic evaluation of broiler chicks fed low protein diets. Annals of Agric. Sci. 42: 1009-1026.

Emmert, J. (2000). Efficiency of phase feeding in broilers. Proceeding, California Animal Nutrition Conference. Fresno California, USA.

Ghazalah, A.A., A.H. Abd El-Gawad, M.S. Soliman and A.W. Youssef (2005). Effect of enzyme preparation on performance of broilers fed corn-soybean meal based diets. Egypt. Poult. Sci. J., 25: 295 – 316.

Gilbert, C. and G. Cooney (2011). Thermo stability of feed enzymes and their practical application in the feed mill. In: Bedford, M.R. and G.G. Partridge (Eds.). Enzymes in farm animal nutrition, 2 Edn., CAB International, Oxfordshire, pp: 249-259.

Gracia, M.I., M.J. Aranibar, R. Lázaro, P. Medel and G.G. Mateos (2003). Alpha-amylase supplementation of broiler diets based on corn. Poult. Sci., 82: 436-442.

Khattak, F.M., T.N. Pasha, Z. Hayat and A. Mahmud (2006). Enzymes in poultry nutrition. J. Animal Plant Sci., 16: 1-7.

Kocher, A., M. Choct, G. Ross, J. Broz and T.K. Chung (2003). Effects of enzyme combinations on AME of corn-SBM based diet in broilers. J. Appl. Poult. Res., 12: 275-283.

Kocher, A., M. Choct, M.D. Porter and J. Broz (2002). Effects of feed enzymes on nutritive value of soybeanmeal fed to broilers. Br. Poult. Sci., 43: 54-63.

Li, H., N. Deeb, H. Zhous, C.M. Ashwell, and S. J. Lamont (2005). Chicken quantitative trait loci for growth and body composition associated with the very low density apolipoprotein-π Gene. Poult. Sci., 84: 697-703.

Marcato, S.M., Sakomura, N.K., Fernandez, J.B.K., Nascimento, D.C.N., Furlan, R.L., and Piva, G.H. (2009). Crescimento e deposição de nutrientes nas penas, músculo, ossos e pele de frangos de corte de duas linhagens comerciais. Ciência e Agrotecnologia, 33: 2011-2014.

Meng, X., B.A. Slominski, L.D. Campbell, W. Guenterand O.Jones (2006). The use of enzyme technology for improvedenergy utilization from full-fat oilseeds. part I: Canola seed. Poult. Sci., 85: 1025-1030.

Nadeem, M.A., M.I. Anjum, A.G. Khan and A. Azim (2005). Effect of dietary supplementation of Non-starch polysaccharide degrading enzymes on growth performance of broiler chicks. Pakistan Vet. J., 25: 183-188.

North, M.O. (1981). Commercial chicken. Production Annual, 2nd Edition, Av., Publishing Company I.N.C., West Post. Connecticut, USA.

NRC, (1994). Nutrient requirements of poultry. Ninth Revised Edition, National Academy Press, Washington D.C.

Ojedapo, L.O., O. Akinokun, T.A. Adedeji, T.B. Olayeni, S.A. Ameen and S.R. Amao (2008). Effect of Strain and Sex on Carcass Characteristics of Three Commercial Broilers Reared in Deep Litter System in the Derived Savannah Area of Nigeria. World J. of Agric. Sci., 4: 487-491.

Saleh, F., M. Tahir, A. Ohtsuka and K. Hayashi, 2005. A mixtureof pure cellulase, hemicellulase and pectinase improves broiler performance. Br. Poult. Sci., 46: 602-606.

SAS institute (2002). SAS/STAT User's Guide statistics Ver. 9.1; SAS institute Inc., Cary, NC.

Sizemore, F.G. and G.F. Barbato (2002). Correlated responses in body composition to divergent selection for exponential growth rate to 1 or 42 days of age in chickens. Poult. Sci., 81: 932-938.

Strada, E.S.O., R.D. Abreu, G.J.C. Oliveira, M.C.M.M. Costa, G.J.L. Carvalho, A.S. Franca, L. Clarton and J.L.M. Azevedo (2005). Enzymes in the broiler diets. Rev. Bras. Zoot., 34: 2369-2375.

Thi, L.N. (2008). Evaluation of fibrous feeds for growing pigs in Vietnam. Acta Univ. Agric. Suec., 22: 1652-1688.

Vieira, S.L. and E.T. MoranJr (1998). Broiler yields using chicks from egg weight extremes and diverse strains. J. of Applied Poult. Res., 7: 339-346.

Walk,C.L., A.J. Cowieson, J.C. Remus, C.L. Novak and A.P. McElroy (2011). Effects of dietary enzymes on performance and intestinal goblet cell number of broilers exposed to a live coccidian oocyst vaccine. Poult. Sci., 90: 91-98.

الملخص العربى

تأثير السلالة ومستويات مختلفة من مخلوط الإنزيمات التجارية والتداخل بينهما على أداء دجاج التسمين وصفات الذبيحة

جمال ناصر ريان، أحمد إبراهيم الفحام، مروان عبدالعزيز محمود
قسم إنتاج الدواجن، كلية الزراعة – جامعة عين شمس، القاهرة – مصر

تهدف هذه الدراسة الى تقييم تأثير السلالة (Avian and Cobb)، ومستويات مختلفة من مخلوط تجارى من الإنزيمات (Phytabex Plus) والتداخل بينهما على أداء دجاج التسمين، صفات الذبيحة والكفاءة الإقتصادية. استخدم فى هذه التجربة عدد ١٨٠ كتكوت تسمين عمر يوم (٩٠ من سلالة كوب Cobb، ٩٠ من سلالة إيفيان Avian). وتم تغذية الكتاكيت داخل كل سلالة على ثلاثة علائق تجريبية، أحدهما استخدمت كعليقة كنترول، فى حين إحتوت العلائق الاخرى على نفس مكونات عليقة الكنترول مضافا إليها مخلوط من إنزيمات تجارية بمعدل (١٠٠ – ٢٠٠ جم/ طن).

- وجد أن وزن الجسم الحى للدجاج عند عمر ٣ أسابيع تأثر معنويا بالسلالة، المستويات المختلفة من الإنزيمات وأيضا التداخل بينهما، حيث أن وزن الجسم لكتاكيت سلالة Cobb كان أثقل معنويا مقارنة بسلالة Avian. أيضا دجاج التسمين الذى تم تغذيته على علائق تحتوى على إنزيمات بمعدل (١٠٠ – ٢٠٠ جم/ طن) كان أثقل وزنا مقارنة بالدجاج الذى تغذى على عليقة الكنترول.
- تأثر إستهلاك العلف اليومى معنويا بالتداخل بين كل من السلالة والإنزيمات.
- وجد أن سلالة Avian أعلى معنويا بالنسبة لكل من وزن الذبيحة، نسبة التصافى، نسبة أجزاء اللحم المأكولة ، فى حين كانت سلالة Cobb أعلى معنويا فى النسبة المئوية للقلب. من ناحية أخرى تأثرت كل من نسبة التصافى، والنسبة المئوية للقانصة بالتداخل بين السلالة والإنزيمات.
- لوحظ أن سلالة Avian كانت أعلى معنويا فيما يخص الوزن النسبى لدهن البطن مقارنة بسلالة Cobb ، بينما سجل دجاج التسمين الذى تم تغذيته على علائق مضاف إليها إنزيمات متعددة (١٠٠ – ٢٠٠ جم/ طن) نسبة دهن بطن أقل مقارنة بالدجاج الذى تغذى على عليقة الكنترول وذلك عند عمر التسويق (٥ أسابيع)
- أوضحت نتائج هذه التجربة أن النسبة المئوية للصدر للدجاج الذى تغذى على علائق الكنترول تمثل فقط ٩٢,٥ % من مثيلتها التى تم تغذيتها على علائق تحتوى على إنزيمات بمعدل (٢٠٠ جم/ طن) وبناءا على ذلك نستطيع القول أن إضافة الإنزيمات الى علائق دجاج التسمين أدت الى زيادة لحم الصدر بنسبة ٧,٥ %. وعلى الجانب الأخر، وفيما يخص السلالة وجد أن سلالة Cobb تفوقت وراثيا وكانت الأعلى بالنسبة للكفاءة الإقتصادية والإنتاجية مقارنة بسلالة Avian ، وأخيرا وجد ان إضافة الإنزيمات التجارية فى علائق دجاج Cobb بمعدل (٢٠٠ جم/ طن) أعطت أفضل قيمة كفاءة نسبية وكفاءة إقتصادية.