RESPONSE OF BROILER CHICKS TO MICROBIAL PHYTASE SUPPLEMENTATION AS INFLUENCED BY DIETARY CALCIUM AND PHOSPHORS LEVELS: 1- PRODUCTIVE PERFORMANCE, CARCASS TRAITS AND ECONOMIC EVALUATION

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SUMMARY

The objective of the experiment was to evaluate the effects of decreasing the phosphorus (P) and calcium (Ca) levels in the broiler diets with or without adding phytase on growth performance, carcass characteristics and economical evaluation. 360 unsexed one-day old Cobb broiler chicks were randomly distributed into 12 treatments (30 birds each).In this experiment, the chicks were treated in factorial design (6×2). Three diets in the period of 1- 21 days (starter) and three diets in the period of 21- 42 days (grower);(100-100) contains 100% Ca and P requirements of the strain according to the breed manual at starter, grower period, (100-75), (100-50), (75-75), (75-50), (50-50). All tested diets without adding phytase and repeated with adding phytase (T1:T6) were evaluated on growth performance, carcass characteristics and economic evaluation. The experiment lasted from 1 to 42day-old. At 42 days of age 6 birds per treatment were collected for carcass characteristics. The results indicated that:

- Productive performance of broiler chicks: live Body weight, daily weight gain, daily feed consumption and feed conversion ratio were not affected significantly by levels of Ca and P or adding phytase at whole experimental period.
- Carcass traits indicated that Ca and P levels had significant effects on (Dressing, gizzard, liver, heart and giblets) percentages and adding phytase had significant effect on heart%.
- Economic evaluation showed that decreasing levels of (Ca and P) and adding phytase had positive effects on net return/bird which reflect on improve economic efficiency.
- In conclusion, the results indicated that birds fed on lower levels of calcium and Phosphorus below the requirements had positive effects especially with adding phytase on productive performance, carcass traits and economic efficiency.

Keywords: *Broilers, Calcium, Phosphors, and Phytase*

INTRODUCTION

Reducing cost of poultry feeding is one of the important goalswhich is given to precision poultry production and maximize economic efficiency of poultry farming. Nutrient management is that the highest concern for today's modern poultry innovativeness because feed represents is that the greatest costs associated with poultry production.

On the other hand, during the last decades, researchers have been investigated the ways which may reduce the environmental pollution by N and phosphorus that utilized for poultry productions. The accurate is important to calculate nutritional allowance of birds to be having nutrient needs. The second approach to enhance the utilization of poultry's nutrients has to be investigated. Levels of N, Ca, P, Cu, Mn, and Zn that found in poultry excreta were significant which led to environmental pollution (Payne, 1998; Paterson, 2002).

The utilization efficiency of dietary P is considered low (20–27%) while, manure phosphorus content is a significant amount (Ferket *et al.*, 2002).

Phosphorus is an essential mineral for poultry to attain maximal potential in growth performance. However, endogenous plant phytate binds to minerals and this has negatively affect processes of digestion and absorption for other nutrients and cause decrease availability of nutrient. Phytase is an exogenous enzyme. It is a feed additive using to release phytate-bound P, so, exogenous phytase adding to diets because it is an effective method to improve P digestibility (Adeola and Cowieson, 2011).

However, level of nutrients specially Ca and P can be decreased in poultry diets when adding phytase to enhance broiler performance. Total P was reduced in the manure of broilers fed the low phosphorus diets ($P<0.01$) in broilers fed phytase (Powell *et al.,* 2008).

Therefore, the aim of this study was to evaluate the effect of decreasing the phosphorus and calcium levels in the broilers diets without or with adding phytase on growth performance, carcass characteristics and economical evaluation.

MATERIALS AND METHODS

The current study was carried out at the Poultry Nutrition Farm, Poultry Production Department, Faculty of Agriculture, Ain Shams University, Shoubra El-kheima, Qalubia Governorate.

A total number 360 one-day Cobb 500 broiler chicks were randomly divided into 12 equal groups, each was subdivided into 3 replicates with (10 chicks/each)

The chicks were fed three diets (100, 75 and 50 %) of Calcium and Phosphorus requirements according to the guidebook of Cobb 500 broilers in the period of 1- 21 days (starter) and in the period of 21- 42 days (grower). All the diets were without adding phytase and with adding phytase. Twelve dietary treatments were distributed according to diets fed consecutively during starter and grower phases Table (1).

Table (1): Composition and calculated analysis of experimental diets.

Ingredients%	Starter			Grower		
	100%	75%	50%	100%	75%	50%
Yellow corn	56.68	57.14	58.52	63.95	64.31	65.10
Soybean meal (44 % CP)	31.15	33.35	34.00	25.18	27.70	29.15
Corn gluten meal(60%CP)	5.60	4.00	3.35	4.10	2.20	1.05
Vegetable Oil	2.00	2.00	1.65	2.50	2.50	2.35
Ca Carbonate	1.60	1.17	0.77	1.47	1.08	0.70
Mono Ca Ph	1.85	1.25	0.64	1.65	1.10	0.56
Salt (NaCl)	0.30	0.30	0.30	0.30	0.30	0.30
Premix*	0.30	0.30	0.30	0.30	0.30	0.30
HCl-Lysine	0.28	0.24	0.22	0.31	0.26	0.23
DL- Methionine	0.24	0.25	0.25	0.24	0.25	0.26
Total	100	100	100	100	100	100
Price L.E /Ton	5680	5550	5410	5420	5280	5150
Calculated analysis:-						
CP %	22	22.01	22.01	19.06	19.02	19.01
ME (Kcal/Kg)	2999	3004	3006	3103	3101	3102
Calcium %	1.01	0.75	0.51	0.91	0.68	0.45
Available phosphorous %	0.51	0.38	0.25	0.46	0.34	0.23
Lysine%	1.32	1.32	1.32	1.2	1.19	1.19
Methionine %	0.62	0.62	0.62	0.57	0.57	0.57
Meth. + Cys. %	0.985	0.984	0.980	0.896	0.891	0.892

** 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.*

Feed and water were supplemented ad-libtum and a constant (23 L: 1 D) light period was provided during the experimental periods. Chicks were individually weight at the beginning of the experiment, then at weekly intervals until the end of experiment, live body weight, body weight gain, feed consumption, and feed conversion ratio were recorded during these periods. At the end of the experiment, 6birds from each experimental group were weighted and slaughtered. Carcass were manually eviscerated and weight. Liver, heart, gizzard and abdominal fat were removed and their relative percentage of live body weight was estimated.

Economic efficiency of broiler chicks was calculated and the prices figures were based on the prices of local market for ingredient and selling prices of chicken in Qalubia governorate, Egypt at September 2018.

Data were analyzed using two way analysis of variance with levels of phosphors and phytase enzyme and their interaction using the General linear Model (GLM) procedure of SAS (2005). When significant differences among means were found, means separated using Duncans multiple range tests (1955).

RESULT AND DISCUSION

Effects of Phytase and successive levels of calcium and phosphorus on productive performance of broiler chicks

Live body weight and daily live body weight gain:

Data in Table (2) was illustrated that no significant different among dietary treatments while numerically T6 was highest live body weight records than those other treatments. However, T3 was the lowest weight after 3 weeks; after 6wks, T2, T3 and T6 were the superior treatments as live body weight value. Adding phytase had positive effect on live body weight. So, it was noticed that daily live body weight of chick according to dietary treatments effect was no significant effect but numerically, during 0-3 wks, T6 followed by T4 were the highest records of daily gain. However, during 3-6wks and overall of 0-6 wks, T2, T3 and T6 had the highest value. These results confirmed by those obtained by Rousseau *et al.* (2016) who reported that during 10 to 35 days of birds 'age, decreasing level of NPP in diets affected on daily gain. However, Kahindi et al. (2017) found that birds fed diets containing sufficient amounts of inorganic phosphorus to meet P requirements had higher ($P<0.001$) daily gain than those fed diets with inorganic phosphorus reduced by 50%. Also, results by Shang *et al.* (2015) showed no significant effects of reduced levels of Ca and available P on birds' growth was observed for all treatments during 5 to 14 d of age. In addition to, broilers fed diets with reduced Ca and P levels and supplemented with phytase were better performance than those fed the same diets with no phytase supplementation, with improvements of feed intake (FI), weight gain (WG), and feed conversion ratio (FCR) (Sousa *et al.,* 2015).

On the other hand, adding phytase developed growth of chicks. Its means that, dietary treatments with decreasing levels of Ca and AP and adding phytase improved metabolism of dietary in chicks. Thus, it noticeable that rate of improvement for adding phytase on broiler gain in T6 (50-50) was the highest value comparing with those others. These results are in agreement with Olukosi *et al.* (2013) and Santos *et al.* (2014) who illustrated that phytase supplementation improved weight gain and growth performance where, it improvement linearly increased with phytase supplementation. Phytase breaks down phytate and provides a more available source of P (Walk *et al.,* 2014).

Daily feed consumption:

It showed at Table (3) the records of daily feed consumption of broiler chicks. During 0-3wks, T6 was the highest significant record of feed consumption and T3 was the lowest. Then, during 3-6wks, using level of 100-50 (T3) lead to improve feed consumption with no significant differ. Consequently, overall 0-6wks, it noticed that feed consumption was the highest value for T6 than those others; numerically. That may be due to low level 50-50; T6 lead chicks to feed more to cover its requirements. Adding phytase decreased daily feed intake with no significant effects. These results are in agreement with results of Shang *et al.* (2015) who showed that, during 5 to 14 days of age, no significant ($P<0.05$) effects on feed intake was observed for all treatments, which indicated that reduce levels of available P did not significantly affected on birds' growth and feed consumption at an early age. While, during 10 to 35 days at all, birds feed intake was 1ower especially with lowest NPP (%) diets and with the high Ca (Rousseau *et al.,* 2016). In addition, supplementation of Phytase enzyme improved ($P<0.05$) feed intake in broilers fed low P (deficient) diets. The results indicated that phytase (at levels of 1000 PU/kg) higher released phytate P that was utilized for growth (Abo Omar and Sabha, 2009).

Feed conversion ratio:

Concerning of feed conversion values in Table (3), there was the highest values for T1 and T6 during the first period while in the second period T5, T1 and T6 hadn't significant high values than others treatments. So, during overall two periods (0-6wks), the same trend was observed. Rousseau et al. (2016) who reported that broilers from 10 to 21 d, which fed the 0.3% NPP diet was lower feed conversion than birds fed the 0.45% NPP diet, but this difference was clear noticed at the lowest Ca level diets

There weren't phytase effect on feed conversion was observed. These results may be due to data of feed consumption and daily live body weight gain which calculated from it. While, the result of the experiment of Shang *et al.* (2015) during 5 to 21 days reported that supplemented diets with phytase decreased feed conversion ratio ($P<0.05$). In addition to, the birds receiving the diet with supplemented phytase linearly increased all the growth performance impact (Olukosi *et al.,* 2013). Furthermore, phytase supplementation at different percent improved ($P<0.05$) feed conversion ratio of broilers at weight of marketing compared to low P diets (Abo Omar and Sabha, 2009)

Effects of Phytase and successive levels of calcium and phosphorus on carcass characteristics:

Table (4) contained data of carcass characteristics for broiler chicks, fed successive levels of dietary Ca and AP with or without phytase enzyme during starter and grower periods. Dressing percentage was significantly higher value with sixth treatment (T6; 50:50) than T3. However; T1, T2, T4 and T5 were in between. Otherwise, third treatment (T3; 100:50) was the lowest ($P<0.05$) value. These results are in harmony with the results obtained for live body weight and average body weight gain which illustrated in Table (12). There weren't any effect for adding phytase on dressing %. The dressing percent (%) of the birds was not responded by phytase supplementation (Abo Omar and Sabha, 2009).

Chicks in treatment one had superior of liver percent with significant effect than chicks in other treatments. No significant different that noticed by adding phytase. Gizzard % was the significantly highest record for chicks received T3 than T1, T4 and T6. One other thing, adding phytase weren't significantly affected on Gizzard % but numerically, gizzard percentage was increased slightly.

The results reported by Sousa *et al.* (2015) that there was no influence of treatments on gizzard relative weight while, investigating addition of phytase with reducing P and Ca diets, liver and heart relative weights significantly increased in broilers fed the diet with no phytase addition. In this study, chicks in treatment 3 (which fed 100% of Ca and AP requirement during starter period then decreased to 50% during grower period) had the highest ($P>0.05$) heart % values than those other dietary treatments. On the other hand, phytase positive effect was clearly found with significantly different whereas, adding phytase increased heart percentage. Concerning on Giblets %; T4, T5 and T6 were the lowest ($P>0.05$) values than those others while, T1 was the highest ($p>0.05$) value. In addition to, adding phytase increased ($P<0.05$) numerically Giblets%. Heart percent increased ($p<0.01$) when birds were fed dietary reduced NPP treatments with no phytase additions. Intestinal length was different ($p<0.10$) in birds fed diets containing phytase, as investigated by Sousa *et al.* (2015). Emmenes *et al.* (2018) observed no differences in carcass yield among broilers had different levels of P in dietary or phytase supplemented diets. Furthermore, Freitas *et al.* (2019) reported that carcass characteristics were not affected by phytase addition in the diets.

Economic efficiency:

The effect of the different treatments diets on the economic efficiency of meat production is presented in Table (5). The economic efficiency values were calculated according to the prevailing market price of feed ingredients as well as the price of one-kilogram live body weight at the end of the experimental period, September 2018 which was 27 L.E.

Consequently, the feed cost of the diet was decreased by decreasing level of Ca and AP (T4, T5 and T6) compared to the control group because decreasing price of diets. It can be also noticed that there are improvements for total return/bird with adding phytase which due to increase of broiler weight and the lower of feed cost. In addition to, decreasing dietary NPP level had positive effect on net return/birds which reflected on economic efficiency. Thus, the results of relative economic efficiencies of the diets containing lower levels of NPP without or with phytase relatively to control (T1) were higher than those other groups. Anjum et al. (2018) broilers fed diets with 50% less di-calcium phosphate (DCP) with adding phytase, the total feed cost per unit weight gain was numerically 14% and 9% less than the broilers fed contained 50% less di-calcium phosphate (DCP) without phytase and positive control diet.So generally, according to data

of this study, it is recommended that using 50% from requirements of phosphorus for broilers during both starter and grower periods was the best treatment.

Conclusion: In conclusion, the results indicated that birds fed on lower levels of calcium and Phosphorus below the requirements had positive effects especially with adding phytase on productive performance, carcass traits and economic efficiency.

Table (2): Effects of Phytase and successive levels of calcium and phosphorus on live body weight and daily live body weight gain of broiler chicks.

Item		Dietary treatments								Prob.		
		T1 (100-100)	T2 (100-75)	T3 (100-50)	T4 (75-75)	T5 (75-50)	T6 (50-50)	Overall	SEM	D	P	D*P
Live body weight g.												
Initial weight	Without phytase	45.60	44.80	44.90	44.07	44.83	42.90	44.52	0.43			
	With phytase	46.20	43.80	43.67	44.17	46.77	44.03	44.77	0.43	NS	NS	NS
	Overall	45.90	44.30	44.28	44.12	45.80	43.47		1.06			
3 wks	Without phytase	654.9	690.20	630.07	672.70	666.9	659.4	662.36	8.12			
	With phytase	646.7	646.4	669.1	673.8	665.53	696.03	666.26	8.12	NS	NS	NS
	Overall	650.80	668.30	649.85	673.25	666.22	677.72		19.89			
6 wks	Without phytase	1816.12	1905.15	1941.65	1896.02	1909.41	1880.00	1891.3	27.79			
	With phytase	1879.03	2032.03	1941.79	1941.10	1799.73	1984.08	1929.6	27.79	NS	NS	NS
	Overall	1847.57	1968.59	1941.72	1918.56	1854.57	1932.04		68.08			
Daily live body weight gain g/day.												
0-3 wks	Without phytase	29.01	30.73	27.87	29.93	29.62	29.36	29.42	0.38			
	With phytase	28.60	28.70	29.78	29.98	29.47	31.05	29.59	0.38	NS	NS	NS
	Overall	28.80	29.71	28.82	29.96	29.54	30.20		0.66			
3-6 wks	Without phytase	55.30	57.85	62.46	58.25	59.17	58.12	58.53	1.25			
	With phytase	58.68	65.98	60.60	60.35	54.01	61.34	60.16	1.25	NS	NS	NS
	Overall	56.99	61.92	61.53	59.30	56.59	59.73		2.17			
0-6 wks	Without phytase	44.26	46.51	47.42	46.30	46.61	45.93	46.17	0.69			
	With phytase	45.82	49.71	47.45	47.42	43.82	48.50	47.12	0.69	NS	NS	NS
	Overall	45.04	48.11	47.44	46.86	45.22	47.21		1.20			

a,b,c: Means in the same row or column with the same letters are not significantly different.

SEM = Standard error of means. NS: Non-significant.

*D = dietary treatments, P= phytase effect, D*P= the interaction between dietary treatments and phytase effect*

Table (3): Effects of Phytase and successive levels of calcium and phosphorus on daily feed consumption and feed conversion ratio of broiler chicks.

Item		Dietary treatments								Prob.		
		T1 (100-100)	T2 (100-75)	T3 (100-50)	T4 (75-75)	T5 (75-50)	T6 (50-50)	Overall	SEM	D	P	D*P
Daily feed consumption												
	Without phytase	41.35	41.27	37.27	40.52	40.08	41.14	40.27	0.54			
0-3 wks	With phytase	38.94	38.73	38.21	40.00	39.49	41.14	39.42	0.54	*	NS	NS
	Overall	40.14^{ab}	40.00^{ab}	37.74^{b}	40.26^{ab}	39.79^{ab}	41.14^{a}		0.95			
	Without phytase	118.52	123.10	131.27	117.38	118.84	125.09	122.37	2.32			
3-6 wks	With phytase	121.43	126.25	119.61	120.17	116.41	124.55	121.40	2.32	NS	NS	NS
	Overall	119.97	124.68	125.44	118.77	117.63	124.82		4.02			
	Without phytase	79.93	82.19	84.27	78.95	79.46	83.11	81.32	1.23			
0-6 wks	With phytase	80.18	82.49	78.91	80.08	77.95	82.85	80.41	1.23	NS	NS	NS
	Overall	80.06	82.34	81.59	79.52	78.71	82.98		2.13			
Feed conversion ratio												
	Without phytase	1.43	1.34	1.34	1.36	1.36	1.40	1.37	0.02			
0-3 wks	With phytase	1.36	1.35	1.29	1.34	1.34	1.33	1.33	0.02	NS	NS	NS
	Overall	1.39	1.35	1.31	1.35	1.35	1.36		0.03			
	Without phytase	2.15	2.17	2.10	2.03	2.07	2.16	2.12	0.05			
3-6 wks	With phytase	2.06	1.92	1.98	2.00	2.17	2.03	2.03	0.05	NS	NS	NS
	Overall	2.11	2.04	2.04	2.02	2.12	2.10		0.09			
	Without phytase	1.90	1.87	1.86	1.80	1.79	1.90	1.85	0.03			
0-6 wks	With phytase	1.83	1.75	1.75	1.78	1.88	1.79	1.80	0.03	NS	NS	NS
	Overall	1.87	1.81	1.81	1.79	1.83	1.85		0.06			

a,b,c: Means in the same row or column with the same letters are not significantly different.

*SEM = Standard error of means. NS: Non-significant. *: (P≤ 0.05)*

*D = dietary treatments, P= phytase effect, D*P= the interaction between dietary treatments and phytase effec*

Table (4): Effects of Phytase and successive levels of calcium and phosphorus on carcass characteristics of broiler chicks.

Item		Dietary treatments								Prob.		
		T1 (100-100)	T2 (100-75)	T3 (100-50)	T4 (75-75)	T5 (75-50)	T6 (50-50)	Overall	SEM	D	P	D*P
Dressing %	Without phytase	73.03	72.55	72.24	72.75	73.35	72.86	72.80	0.21			
	With phytase	72.18	73.60	72.58	72.53	72.50	73.40	72.80	0.21	*	NS	NS
	Overall	72.61^{ab}	73.08^{ab}	72.41^{b}	72.64^{ab}	72.93^{ab}	73.13^{a}		0.12			
Liver %	Without phytase	3.37	3.46	3.10	3.12	3.03	3.02	3.18	0.10			
	With phytase	4.71	2.82	3.04	2.66	2.62	2.77	3.10	0.10	*	NS	NS
	Overall	4.04^{a}	3.14^{b}	3.07^{b}	2.89^{b}	2.82^{b}	2.89^{b}		0.06			
Gizzard %	Without phytase	1.61	1.85	2.04	1.75	1.89	1.79	1.82	0.07			
	With phytase	1.88	1.83	2.11	1.77	2.05	1.59	1.87	0.07	**	NS	NS
	Overall	1.74^{c}	1.84^{abc}	2.08^{a}	1.76^{bc}	1.97^{ab}	1.69^{c}		0.04			
Heart %	Without phytase	0.61	0.61	0.62	0.66	0.58	0.55	0.61^{b}	0.02			
	With phytase	0.62	0.62	0.82	0.68	0.61	0.68	0.67^{a}	0.02	*	*	NS
	Overall	0.61^{b}	0.62^{b}	0.72^{a}	0.67^{ab}	0.60^{b}	0.61^{b}		0.01			
Giblets %	Without phytase	5.72	6.04	5.89	5.65	5.65	5.49	5.74	0.13			
	With phytase	7.31	5.40	6.11	5.23	5.45	5.17	5.78	0.13	**	NS	NS
	Overall	6.51^{a}	5.72^{ab}	6.00^{b}	5.44^{c}	5.55^{c}	5.33^{c}		0.07			

a,b,c: Means in the same row or column with the same letters are not significantly different.

*SEM = Standard error of means. NS: Non-significant. *: ($P \leq 0.05$)*

*D = dietary treatments, P= phytase effect, D*P= the interaction between dietary treatments and phytase effect*

Table (5): Effects of Phytase and successive levels of calcium and phosphorus on economic efficiency of broiler chicks.

		Dietary Treatments					
	Adding phytase	**T1 (100-100)**	**T2 (100-75)**	**T3 (100-50)**	**T4 (75-75)**	**T5 (75-50)**	**T6 (50-50)**
Feed Cost / Bird (LE)	Without	18.42	18.57	18.65	17.74	17.53	18.20
	With	18.48	18.63	17.51	18.00	17.20	18.16
Total Cost[1] / Bird (LE)	Without	30.42	30.57	30.65	29.74	29.53	30.20
	With	30.48	30.63	29.51	30.00	29.20	30.16
Total Return[2] Bird (LE)	Without	49.04	51.44	52.43	51.19	51.55	50.76
	With	50.73	54.86	52.43	52.41	48.59	53.57
Net Return / Bird (LE)	Without	18.61	20.86	21.79	21.45	22.03	20.56
	With	20.26	24.23	22.93	22.41	19.39	23.41
Economic Efficiency[3]	Without	61.18	68.23	71.10	72.13	74.60	68.05
	With	66.47	79.11	77.71	74.70	66.38	77.63
Relative Economic Efficiency[4]	Without	100	111.52	116.21	117.90	121.93	111.23
	With	100	119.02	116.91	112.38	99.87	116.78

1 Total cost = (feed cost + price of one-day live chicks + incidental costs); L.E.: Egyptian Pound

2 According to the local price of Kg sold live birds was 27.00 L.E.

*3 Economic efficiency = net return/total feed cost*100. Whereas net revenue= total return - total feed cost.*

4 Assuming that the relative economic efficiency of control group equals 100.

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استجابة كتاكيت اللحم لاضافة انزيم الفيتيز لعلائق تحتوي على مستويات مختلفة من الكالسيوم والفوسفور: 2- الاداء الانتاجى وصفات الذبيحة والعائد الاقتصادى

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الهدف من البحث هو التعرف على تاثير تخفيض مستوى الكالسيوم والفوسفو فى علائق كتاكيت التسمين مع او بدون اضافة انزيم الفيتيز على الاداء الانتاجى وصفات الذبيحة والعائد الاقتصادى.

استخدم فى التجربة 360 كتكوت غير مجنس عمر يوم سلالة Cobb 500 وزعت عشوائيا على 12 معاملة (30 كتكوت/معاملة) احتوت كل معاملة على (3 مكررات/10 كتكوت).

غذيت الكتاكيت على عليقة بادئ (1-21 يوم) ثم عليقة نامى (22-42 يوم) واحتوت تلك العلائق على مستويات مختلفة فى الكالسيوم والفوسفور كالاتى (100-100%) احتياجات تبعا لكتالوج السلالة و (100-75%) و (100-50%) و(75-75%) و(75-50%) و(50-50%) ليكونوا 6 معاملات (T1-6) مع او بدون اضافة انزيم الفيتيز

عند عمر 42 يوم اختير 6 طيور من كل معاملة لدراسة صفات الذبيحة.

يمكن تلخيص اهم النتائج كالاتى:

- لا يوجد تاثير معنوي للمعاملات الغذائية المختلفة على الوزن الحى او الوزن المكتسب اليومى او استهلاك اليومى للعلف او معامل التحويل الغذائى الا ان المعاملة T2 سجلت اعلى وزن حى ومكتسب رقميا بالمقارنة بالمعاملات الاخرى كما سجلت كتاكيت معاملة T6 اعلى استهلاك علف رقميا.
- تأثرت معنويا معظم صفات الذبيحة حيث سجلت معاملة T6 اعلى قيم لـ % للذبيحة واقل القيم لـ % للحوائج كما ان اضافة الفيتيز حسن معنويا % للقلب
- تقليل مستوى الكالسيوم والفوسفور مع اضافة انزيم الفيتيز في علائق كتاكيت التسمين حسن من العائد الاقتصادى.

الخلاصة: تخفيض مستوي الكالسيوم والفوسفور فى علائق كتاكيت اللحم له تاثير ايجابي على الاداء الانتاجى وصفات الذبيحة والعائد اقتصادى وخاصة مع اضافة انزيم الفيتيز.