RESPONSE OF BROILER CHICKS TO MICROBIAL PHYTASE SUPPLEMENTATION AS INFLUENCED BY DIETARY CALCIUM AND PHOSPHORUS LEVELS: 2- BONE PARAMETERS AND NUTRIENT EXCRETION AND RETENTION

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(Received 13/09/2023, accepted 01/11/2023)

SUMMARY

An experiment was conducted to determine and compare the differences in some bone parameters and nutrient excretion and retention of broiler chicks fed 6 different dietary calcium (Ca) and phosphorus (P) levels with or without phytase in factorial design (6×2). A total of 360 one day-old Cobb 500 broiler were assigned to 12 dietary treatments with 3 replicates cages of 10 birds each in factorial design with 6 dietary calcium and Phosphorus levels with or without phytase. Mash diets were corn and soybean-meal based and fed ad-libitum up to 42 days of age. At the end of experiment 6 birds per treatments were slaughtered, lift tibia excised and tibia parameters, (tibia length, width, breaking strength, seedor index, ash%, Ca% and P%) were measurements. The mineral content of calcium and phosphors in feed and excreta were determined and retention of mineral was calculated. The results indicated that:

- Different dietary treatments and adding phytase failed to be significant effect on all tibia measurements except tibia breaking strength.
- Different dietary treatments and adding phytase had significant effects on tibia ash%
- Tibia Ca and P percentages significant affected by dietary treatments
- Ca and P execration and retention significantly affected by different dietary treatments

In conclusion, decreasing Ca and P% in the treatments diets didn't affected tibia measurements except tibia breathing strength and decreasing percentages of Ca and P excretion either with or without phytase which retention on enhancement Ca and P retention values.

Keywords: *broilers, calcium, phosphors, and phytase*

INTRODUCTION

Nutrient management is of major concern for today's modern poultry enterprise because feed represents the greatest single expenditure associated with poultry production. Major emphasis is given to precision feeding to reduce cost of feeding and maximize economic efficiency of poultry farming.

Phosphorus (P) is one of the essential minerals for broiler chicks, due to its critical function on metabolic process. It is also, required to attain bird's optimum genetic potential in growth, feed efficiency and skeletal integrity (bone minerlization) (Pekel *et al.*, 2017). It was demonstrated in broilers that for achieving maximum bone mineralization, a higher (P) supply is required compared to the P requirement for growth and better feed efficiency (Aletor *et al.*, 2000). Selle and Ravindran (2007), reported that, a marginal dietary (P) supply reduces bone development and broiler performance while a high (P) content of diet increased environmental pollution and diet cost. Also, Emam (2018) reinforced that enzyme technology reduces Pollution excretion in animal waste. There are many enzymes available to help the digestion of phosphorus, calcium, carbohydrates, protein and lipids of diets offered to the poultry and swine.

Phytase enzyme has mainly been considered to be a tool to increase (P) availability/digestibility from vegetable sources and so reduce the inclusion of higher cost (P) sources such as organic phosphorus and animal by-products. Phosphorus retention by broilers was improved from 50 to 60 by supplementing diet with phytase enzyme (Sebastian *et al.*, 2007)

Abd el-hack *et al.* (2018) demonstrated that most of the reported literature suggests that phytase enzyme improved the phosphorus availability for the biochemical functions in the animal's body. In addition to, phytase had effect on hydrolyze phytate, which works under gut pH with wide range but the efficacy might be affected by several factors.

Aletor *et al.* (2000) reported that, there were significant effects with phytase type or the interaction between the phytase enzyme type and Ca: available P ratios were noted for Phosphorus ileal digestibility. Rations supplemented with phytase enhanced ileum P digestibility (65.87%) when provided to low Ca: available P.

Srikanthithasan *et al.* (2020) illustrated that tibia length of birds fed high or low levels of phytase were higher than those of broilers fed control (without phytase).

Fernandes *et al.* (2019) showed that linear effect with inclusion of phytase was observed. The highest values of both Ca and P deposited in tibia were revealed by phytase high level which reflected on tibia resistance and great breaking strength values.

Santos *et al.* (2014) illustrated that broilers fed low available P diets had lowest value of tibia ash ($P < 0.05$) and highest records ($P<0.05$) in broilers fed the rations with added mono and dicalcium phosphate comparing with those all other diets.

This research was conducted to determine the effects of using various levels of phosphors and calcium in the broiler diet with or without phytase on some bone measurements and phosphors & calcium retention.

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, during Sep. 2018

Experimental design:

Three hundred and sixty unsexed one - day old of Cobb 500 broiler chicks were obtained from commercial hatchery (Ismailia governorate), which randomly distributed into twelve treatments. Chicks immediately after the reception were fed experimental diets till six weeks of age; each treatment was divided in to 3 replicates, ten birds each. Feed was offered ad-libitum in mash form according to experimental diets in stainless steel feeders for each pen. Fresh water was accessible all the time by automatic nipple drinkers.

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).

Calcium and phosphorus determination:

The mineral contents of Ca and P in feed, excreta and bone samples were determined by (ICP optima 2000 DV, Perkin Elmer) according to method described in AOAC (2012) in second experiment. Retention of Ca and P percentage were calculated.

Bone analysis sampling and measurements:

Six tibiae were removed from four birds for each treatment at the end of experiment and then numbered and frozen at – 20º C until further analyses.

Tibiae were firstly thawed at room temperature and then measured (in millimeters) for their length (from proximal to distal end) and width using a Stainless-Steel digital micrometer according to the method described by Samejima (1990).

The seedor index (SI) was obtained when a tibia dry weight (in grams) is divided by its length (cm), as reported by Seedor *et al.* (1991).

Bone breaking strength was determined using the method prescribed by Fleming *et al.* (1998).

Statistical analysis:

Data that were collected in the study were statistically analyzed using the general linear models (GLM) of SAS, (2005), used Two- way classification as follow:

$$Yijkl = \mu + Di + Pj + (D*P)k + eijkl$$

Where: Yijkl= observation of the parameter measured.

μ = overall mean Di = effect of dietary treatments, Pj= phytase effect, (D*P)k= the interaction between dietary treatments and phytase effect. eijkl = random error effect.

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.*

RESULTS AND DISCUSSION

Effects of phytase and successive levels of calcium and phosphorus on bone characteristics of broiler chicks:

Bone measurements:

Table (2) illustrated the effect of different treatments and phytase on bone measurements (Tibia Length (cm), Tibia Width (cm), Tibia breaking strength, Tibia Seedor Index (SI). All measurements hadn't significant different except tibia breaking strength by the different treatments , even T1 and T2 recorded the highest tibia breaking strength records compared with those other treatments, so there was an improvement of tibia strength. These results are in agreement with Rousseau *et al.* (2016) who found tibia breaking strength at 35 days was higher for broilers fed Ca with 0.6 percent and NPP 0.30 percent diets. In addition to, broilers fed diet with low concentration of Ca and NPP resulting in depression of tibia breaking strengths compared to the other diets. These results are in agreement with Liu *et al.* (2017) who found that diets with low NPP level affected ($P<0.0001$) tibia bone strength. Furthermore, birds fed the diets with decreasing phosphorus intake content from 100 to 0% linearly reducing ($P<0.05$) tibia length in chicks. In addition to, the diets with 50% low P or no supplemented P resulted in decreasing available P content which led to decrease tibia length (Kahindi *et al.*, 2017). Furthermore, adding phytase had positive response on tibia breaking strength. These results are confirmed by results of Zeller *et al.* (2015) who found that bone breaking strength were increased significantly by phytase supplementation.

Also, different treatments effect on Tibia seedor index (SI) Table (2), broilers of T2, T5 and T6 recorded the highest significant SI values with no significant differences compared with those other treatments, that's mean reducing level of Ca and AP by 0 to 25% from starter to grower period had improvement of tibia index regardless of the level in starter period.

In addition to in this study, no significant response by adding phytase was observed. Also, Künzel *et al.* (2019b) reported no effects of phytate and phytase levels were observed for Seedor Index.

It can concluded that by reducing level of dietary Ca and AP, decreasing tibia breaking strength which reflect on increasing tibia seedor index (SI) without any effect for adding phytase enzyme to rations.

Bone composition:

Data of effects of dietary treatments and phytase on bone composition of broiler chicks were found in Table (3). Different dietary treatments and adding phytase failed to significant effect on DM%. Tibia DM % content was significantly higher ($p<0.05$) in birds fed diets reduced phytase content compared with those broilers fed control diet (Sousa *et al.,* 2015). On the other composition, different treatments and phytase had effective on the tibia Ash%. Where, broilers fed dietary treatments with adding Phytase increased the ash percent compared with chicks fed diet without phytase. That's mean, phytase affected on the bone density and that elucidated on the breaking strength data. Also, broilers fed T1 had the highest significant values compared with those other treatments. These results are in agreement with Liu *et al.* (2017) who found that diets with low NPP level significantly affected on tibia ash % and tibia ash concentration. In addition to, the diets with 50% low P or no supplemented P resulted in decreasing available P content which led to decrease ash content (Kahindi *et al.,* 2017). The results were confirmed by results of Watson *et al.* (2006) that tibia ash percentage was reduced by decreasing of Ca and NPP diets and also, adding phytase improved ash percentages.

Tibia ash was significantly ($P<0.05$) lowest value in broilers fed low-available P diets and highest record ($P<0.05$) in broilers fed the diets supplemented with mono-di-calcium phosphate compared with all others. While, broilers tibia ash percent was significantly ($P<0.05$) increased in broiler fed dietary with adding phytase as observed by Abo Omar and Sabha (2009) and (Broch *et al.,* 2020). On the other wise, tibia ash content was no significant different between treatments throughout 35 days for broilers fed 0.6% Ca and 0.30% NPP diet (Rousseau *et al.,* 2016). These results are confirmed by results of Zeller *et al.* (2015) who found that tibia dry weight and tibia ash weight were increased significantly by phytase supplementation. Tibia ash percent was higher significant ($P<0.05$) record in birds fed phytase regardless of the level of phytate in the broiler diets (Santos *et al.,* 2014).

By Concerning to tibia Ca % which illustrated in Table (3), there were effect of different treatments on the Ca % where T2 and T4 recorded the highest significant values than other treatments while, T5 and T6 significantly decreased by reducing level of phosphorus.

Table (3) showed data of the effect different treatments on the tibia P %. Broiler of T6 had the highest values for the P % in tibia compared with those other treatments.

From these results, it could be concluded that different dietary treatments and phytase had effect on the Ca and P metabolism subsequently effect on tibia measurements and composition and lead to improvement of Ca and P metabolism thus, increasing tibia density and strength. These contribute very important results for decreasing broiler production cost.

These results are in agreement with Liu *et al.* (2017) who found that diets with low NPP level significantly affected on tibia P concentration. In addition to, the diets with 50% low P or no supplemented P resulted in decreasing available P content which led to decrease ash content (Kahindi *et al.,* 2017). In addition to, linear correlation determined as phytase inclusion heightened and bone mineralization elevated (Pieniazek *et al.,* 2017).

Also,phytase addition enhanced tibia mineralization of the broilers whereas, tibia ash improved quadratically (Olukosi *et al.,.*, 2013). Generally, adding phytase to the diet containing 0.20% NPP percent, both weight and percent of tibia ash were increased compared to those in broiler fed the 0.20% NPP diet without phytase ($P<0.05$) (Zeller *et al.,* 2015).

Effects of phytase and successive levels of calcium and phosphorus on calcium and phosphorus retention of broiler chicks:

Calcium and phosphorus excretion and retention of broiler chicks fed different dietary treatments are summarized in Table (4). Broilers fed diet of T1 (100/100; control; with and without phytase) had significantly different higher records of P and Ca excretion among treatments. Whenever decreasing Ca and AP levels in the diets, decreasing percent of P and Ca excretion either with or without phytase. Moreover, broilers of T6 (50/50) were the lowest values than those others. On the other hand, there were significant different as P and Ca retention values among treatments. Broilers of T6 had significantly highest P and Ca retention as overall values than those other broilers. In addition to, adding phytase was the positive effect on all broiler checks for P and Ca excretion and retention data. Continuously, broilers fed T1 had lowest significant Ca retention records than those others. Decreasing dietary P showed decreasing of P and Ca excretion which reflect on enhancement retention of both of P and Ca retention as found in T6 (50-50) that mean birds utilized from Ca and P with optimal way. On the other wise, unused portions of the phosphorus as well as the indigestible phytate are excreted resulting in high percent of P in manure in broilers fed T1 causing environmental pollution while adding phytase for others groups resulting in decreasing P excretion which reflected on Ca and P retention percentage. These results are confirmed by results of El-Sherbiny *et al.* (2010) that found decreasing dietary di-calcium phosphate showed significant decrease in the excreted Ca and P, using enzymes in poultry diets improves availability of certain nutrients, mainly phosphorus and calcium, diminishing its presence on excreta. Reducing the IP content from 100 to 0% had linear relation ($P<0.05$) with the apparent P retention improved in birds (Kahindi *et al.*, 2017). Decreasing Ca and P diet containing phytase, there was higher Ca and P retention (% DM) furthermore, Ca to P ratio significantly enhanced ($p<0.05$) when the diets were supplemented with phytase (Sousa *et al.*, 2015). Phytase inclusion for broiler diets significantly increased ($P<0.001$) apparent deposit of P and Ca) Pekel *et al.,* 2017). Linear effect was observed with inclusion of phytase. The highest values for both Ca and P in diets the deposition rate of Ca and P was increased which reflected on tibia resistance, greatening breaking strength (Fernandes *et al.*, 2019).

Efficiency of dietary phosphorus utilization (plant origin) is relatively low (20–27%), and found significant values of phosphorus excreted in litter and manure (Ferket *et al.*, 2002).

In addition to, Cowieson *et al.* (2004) reported that high percent of phytate consumption in birds diets is excreted in excreta which resulting in high cost of the diets and contribute to pollute the environment (Pallauf *et al.,* 1994; Musapuor *et al.,* 2006). So, phosphorus is one of the most effective elements in contaminate environment. Generally, the increased tibia weight and tibia ash noticed with phytase supplementation where, birds consumed higher feed and had more P digestibility with phytase supplementation, which resulted to more P and other nutrients available for bone growth (Amerah *et al.,* 2014).

In conclusion, decreasing Ca and P% in the treatments diets, decreasing percentages of Ca and P excretion either with or without phytase which retention on enhancement Ca and P retention values.

Table (2): Effects of Phytase and successive levels of calcium and phosphorus on bone measurements of broiler chicks.

Item		T1 (100-100)	T2 (100-75)	T3 (100-50)	T4 (75-75)	T5 (75-50)	T6 (50-50)	Overall	SEM	D	P	D*P
		Dietary treatments								Prob.		
Tibia Length (cm)	Without phytase	9.33	9.35	9.29	9.33	9.05	9.24	9.27	0.34			
	With phytase	9.40	9.35	9.09	9.15	9.30	9.19	9.25	0.34	NS	NS	NS
	Overall	9.36	9.35	9.19	9.24	9.18	9.21		0.60			
Tibia Width (cm)	Without phytase	0.69	0.77	0.71	0.74	0.71	0.71	0.72	0.16			
	With phytase	0.81	0.75	0.72	0.72	0.73	0.78	0.75	0.16	NS	NS	NS
	Overall	0.75	0.76	0.72	0.73	0.72	0.75		0.28			
Tibia breaking strength	Without phytase	31.63	30.42	28.34	28.47	29.35	28.15	29.39	0.31			
	With phytase	31.18	30.08	29.80	30.13	29.50	29.98	30.11	0.31	*	N.S	N.S.
	Overall	31.41^{a}	30.25^{ab}	29.07^{b}	29.30^{b}	29.43^{b}	29.06^{b}		0.54			
Tibia Seedor Index (SI)[1]	Without phytase	1.08	1.12	1.07	1.10	1.16	1.04	1.10	0.02			
	With phytase	1.03	1.17	0.98	1.03	1.13	1.25	1.10	0.02	N.S	N.S	N.S
	Overall	1.06	1.15	1.03	1.07	1.14	1.15		0.03			

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*

1 : Seedoret al.,. (1991);

Table (3): Effects of Phytase and successive levels of calcium and phosphorus on bone composition 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
Tibia DM%	Without phytase	51.40	50.15	47.12	50.57	48.84	47.38	49.25	0.58			
	With phytase	48.58	48.79	48.99	52.02	49.14	49.95	49.58	0.58	NS	NS	NS
	Overall	49.99	49.47	48.06	51.29	48.99	48.66		1.02			
Tibia Ash%	Without phytase	36.67	33.33	30.00	23.33	26.67	20.00	28.33^{b}	0.17			
	With phytase	40.00	30.00	36.67	33.33	33.33	33.33	34.44^{a}	0.17	*	*	NS
	Overall	38.33^{a}	31.66^{ab}	33.33^{ab}	28.33^{b}	30.00^{ab}	26.66^{b}		0.30			
Tibia Ca%	Without phytase	20.00	21.54	20.04	23.34	21.30	20.11	21.05	0.16			
	With phytase	20.14	22.53	20.95	19.71	20.12	21.32	20.79	0.16	*	NS	NS
	Overall	20.07^{b}	22.03^{a}	20.50^{b}	21.52^{a}	20.71^{b}	20.72^{b}		0.28			
Tibia P%	Without phytase	10.92	11.17	10.87	11.55	11.36	11.78	11.28	0.13			
	With phytase	11.15	10.05	11.85	11.25	11.26	11.53	11.18	0.13	*	NS	NS
	Overall	11.04^{ab}	10.61^{b}	11.36^{ab}	11.40^{ab}	11.31^{ab}	11.66^{a}		0.24			

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 (4): Effects of Phytase and successive levels of calcium and phosphorus on calcium and phosphorus retention 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**
P execration %	Without phytase	47.12	40.36	27.25	27.04	26.53	24.59	32.15	0.38			
	With phytase	44.19	36.45	26.29	26.23	23.34	24.06	30.09	0.38	*	NS	NS
	Overall	45.66^{a}	38.41^{b}	26.77^{C}	26.64^{c}	24.94^{dc}	24.33^{d}		0.66			
P retention %	Without phytase	52.88	59.64	72.75	72.96	73.47	75.41	67.85	0.38			
	With phytase	55.81	63.55	73.71	73.77	76.66	75.94	69.91	0.38	*	NS	NS
	Overall	54.35^{d}	61.60^{c}	73.23^{b}	73.37^{b}	75.07^{ab}	75.68^{a}		0.66			
Ca execration %	Without phytase	50.80	35.42	24.01	25.56	29.92	23.64	31.56	0.61			
	With phytase	50.09	31.77	23.20	21.84	24.53	21.25	28.78	0.61	*	NS	NS
	Overall	50.45^{a}	33.60^{b}	23.61^{d}	23.70^{d}	27.23^{c}	22.45^{d}		1.06			
Ca retention %	Without phytase	49.19	64.57	75.98	74.43	70.07	76.35	68.43	0.61			
	With phytase	49.90	68.22	76.79	78.15	75.46	78.74	71.21	0.61	*	NS	NS
	Overall	49.55^{d}	66.40^{c}	76.39^{a}	76.29^{a}	72.77^{b}	77.55^{a}		1.06			

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.

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

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استجابة كتاكيت اللحم لاضافة انزيم الفيتز لعلائق تحتوى على مستويات مختلفة من الكالسيوم والفوسفور: 2- صفات العظم وافراز واحتجاز العناصر الغذائية

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اجريت تجربة لدراسة صفات العظام وافراز واحتجاز العناصر الغذائية لدجاج اللحم مغذاه على 6 مستويات مختلفة من الكالسيوم والفوسفور مع او بدون اضافة انزيم الفيتز فى تجربة عاملية (6×2).

استخدمت فى التجربة 360 كتكوت سلالة Cobb 500 غير مجنسة قسمت على 12 معاملة غذائية لكل معاملة بها 3 مكررات/10 كتاكيت. غذيت الكتاكيت على علائق ناعمة (ذرة/كسب فول صويا) بصورة حرة حتى 42 يوم. اختير للذبح 6 طيور من كل معاملة فى نهائة التجربة حيث اجريت القياسات على 6 عظمة ساق (طول , عرض , قوة كسرة , موشر سيدو , % رماد , % كالسيوم , % للفوسفور) وتم تقدير % للكالسيوم والفوسفور فى علائق والزرق لحساب المحتجز من تلك العناصر.

نتائج التجربة اوضحت الاتى:

- لايوجد تاثير معنوي للمعاملات الغذائية (مستويات الكالسيوم والفوسفور مع او بدون اضافة انزيم الفيتيز) على جميع صفات عظمة الساق فيما عدا قوة الكسر
- المعاملات الغذائية المختلفة مع او بدون اضافة انزيم الفيتيز لهم تاثير معنوى على النسبة المؤية لرماد عظمة الساق
- مستوى الكالسيوم والفوسفور فى العلائق لة تاثير معنولا على % كالسيوم 2% فوسفور لعظمة الساق
- مستوى الكالسيوم والفوسفور له تاثير على افراز واحتجاز الكالسيوم والفوسفور

الخلاصة:

انخفاض مستوى الكالسيوم والفوسفور فى علائق دجاج اللحم ليس له تاثير معنوى على صفات عظمة الساق فيما عدا قوة المسر وكذلك يودي الى انخفاض نسبة الكالسيوم والفوسفور الخارج سواء باضافة الفيتيز او بدونه مما ينعكس على قيم الفوسفور والكالسيوم المحتجز