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Effect of Dietary Phytase at Difference Phosphorous, High Nitrogen On Broiler Chicks Production

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ملخص البحث

أختبرت في هذه الدراسة الفوائد الإنتاجية لإنزيم الفايتيز التجاري (رونوزايم). تم استخدام 72 كتكوتا لاحما من سلالة روص-308 غير مجنسة عمر يوم واحد، قسمت عشوائياُ الي مجموعتين تجربة x ثلاثة مكررات بكل واحد منها ستة كتاكيت، غذيت هذه الكتاكيت على مستويين من الفوسفور 0.45% و0.30% على التوالي في علف بمستوي بروتين خام 23% اضيف إليه 750 وحدة أنزيم الفايتيز فوسفور, ومستوي طاقة 3 ميجاكالوري كجم/غذاء. كانت مدة الاعلاف التجريبي 42 يوم.

البيانات المتحصل عليها في التجربة غطت الأداء الإنتاجي، بياتات قياسات الذبيحة وجسد الذبيح، قياسات الخصائص الفيزيائية والكيميائية لعظمة الساق، موازين الكالسيوم والفوسفور والتقييم الاقتصادي.

تشير النتائج المتحصل عليها علي أن تزويد العلائق بإنزيم الفايتيز قد حسن الأداء الإنتاجي تحسينا ملحوظاً،خاصة عند الجرعة 750 وحدة انزيم مع فوسفور 0.45% حيث سجلت أعلي نتيجة بالمقارنة مع فوسفور 0.30% بالنسبة الي وزن الجسم (1988.86 ±6.79، (1600±7.086) متوسط الوزن الساخن (1414.47±148.62)، (1328.29±121.3) والوزن البارد (1427.47±121.34)،(1305.29±148.61) جسدالذبيح.

كانت نسبة الفوسفورالكلي (85.95±0.82)، (83.11±0.82) والكالسيوم الكلي(85.24±0.47)،(78.87±0.47)المستبقيين والبروتين الكلي 7.50±0.65)

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(7.50±0.82) أعلي عند الجرعة 750 وحدة انزيم علي التوالي. نسب معدل الربحية كانت أعلي في مجموعات الاختبار عنها في المجموعة المرجعية, وسجلت جرعة 750 وحدة انزيم أعلى قيمة (1.076)(1.065) علي التوالي.

Abstract

A study was conducted to examine the effects of adding commercial microbial phytase (Ronozyme) FYT/U/kg diets on the performance in broilers day- fed adequate phosphorus. Two experiments were run, using seventy two old unsexed Ross-308 broiler chicks, allotted randomly to four treatments× three replicates, each of six chicks, and fed for 42 days. Experiments used high (0.45%) and low (0.30%) P with (23%) (Crude Protein) CP, all at 3(Mega Calorie) Mcal/kg feed. Data collected in all experiments covered performance, serum metabolites, slaughter and carcass data, tibia bone physical and chemical measurements, Ca and P balances and economical evaluations.

The performance values ((Weight Gain) WG, F I (Feed Intake), (Feed Conversion Ratio) FCR and energy intake) for the 750 FYT /U / kg diets were higher **(P< 0.05)** in test groups than the control. Test groups (the 750 FYT/U/kg diets) mean values for cholesterol and lipids were higher **(P< 0.05)** than the control except for serum proteins (7.34±07) in the low nP low CP% plane. Slaughter and carcass values for the 750 FYT/U/kg diets revealed that all parameters in slaughter weight, hot and cold carcasses and dressing percentages based upon them and total edible parts% to be higher **(P< 0.05)** than the control. All tibia bone measurements for the 750 FYT/U/kg diets were higher compared to the control. Total P and Ca consumptions and total P and Ca retentions% for the 750 FYT/U/kg diets were higher **(P< 0.05)** compared to the control except for the high **(P< 0.05)** nP low CP% planes where P and Ca consumptions were lower **(P< 0.05)** (2960.16 ±4.41 and 4905.60 ±27.9).Profitability ratios (1.065 and, 1.076,) of the test groups (750 FYT/U) were always higher than the control group. Results of the present study suggest that the addition of dietary phytase was found to increase the phytin phosphorous utilization and similarly reduce the phosphorous loss in the excreta.

Keywords: Phytase, Phosphorous, *economical evaluations*, Broiler, Nitrogen
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INTRODUCTION

(**Vohra *et al*., 1965; Morris, 1986)**Phytic acid has the potential to form complexes with protein or cations such as Ca, Mg, Zn, and Cu**(Cosgrove, 1980; Anderson, 1985**)reported that which can negatively affect availabilities and digestibility of minerals or protein and amino acids. **Spencer *et al*., (2000)** suggested that diets containing low-phytate with no added phosphorus from an inorganic source significantly increased the nitrogen, phosphorus ratio in the swine waste, making it more environmentally suitable for land application. An increase in calcium digestibility was seen in swine diets formulated with low-phytate corn, and it may be possible that the digestibility of other cations or amino acids may be enhanced by the use of this corn hybrid**. Harland and Oberleas (1999)** documented that phytate is a compound that contains bound P and other minerals, and it is found in most plants**. Biehl *et al.*, (1995)** found that exogenous phytase is effective in improving utilization of phytate-bound minerals (especially P and Zn) in diets for swine and poultry**. (Biehl *et al*., 1997; Sami *et al*., 1999 Rutherfurd *et al*., 2004; Zhang *et al*., 2008)** reported that microbial phytase was generally effective to the end of the small intestine in improving the digestibility of phytate P, total P, and amino acids in a conventional corn-soybean diet for poultry. **Keshavarz and Austic (2004**) Indicated that a 13% protein diet plus methionine, lysine, and tryptophan to 100% can result in performance at least comparable to a diet containing 16% protein. **(Shelton *et al,*. 2004; Ravindran *et al.*, 2001_a)** reported that broilers fed the diets with phytase using the nutrient matrix for metabolic energy and amino acids resulted in similar growth performance compared with broilers fed the deficient diets. **Payne et al., (2005)** suggested that phytase enzymes produce similar growth and bone ash traits in commercial broilers and the abilities of Natuphos or Ronozyme phytase to liberate phytate-P are similar when included in low Ca and nPP diets for broilers. Either source can be fed to commercial broilers to aid in improving phytate-bound P use**. Yan *et al.*, (2003)** documented that the estimates of NPP needed to maximize tibia ash without phytase supplementation resulted in significantly reduced tibia ash compared to birds fed commercial levels of NPP**.** The present study was conducted to evaluated effect of dietary phytase at difference phosphorous high nitrogen on broiler chick's production.

MATERIALS AND METHODS

Experimental chicks and rations

A total number of 72 day– old commercial unsexed broiler chicks of Ross 308 strain were obtained. Six pens,1.5m^2 each, a basal diet was formulated to yield 23% CP and 3000kcal ME/kg being adequate in all nutrients except for nP and calcium. As shown in **Table (1).** The nP (0.45% and 0.30%) and Ca (1.84and1.60) were balanced by using oyster shell flour and bone meal **(Sulieman and Mabrouk, Afaf 1999).** lysine was set at 1.20% and the methionine 0.45 %.

Table .1The percentage and calculated analysis of experimental diets

Ingredients	Ration (1)%	Ration (2)%	Calculated analysis	(1)	(2)
Fetarita(Sorghum)	60.46	60.460	Crude protein%	23	23
Ground nut cake	14.46	15.000	Ether extract%	3.5	3.30
Sesame cake	14.80	14.960	Crude fiber%	11.80	10.70
Bone meal	02.11	0.774	Ash%	4.20	3.8
Wheat brand	00.50	3.306	M E, Kcal/Kg	3000	3000
Salt	02.67	00.50	Total P%	0.678	0.881
Concentrate	05.00	5.000	a phosphorous%	045	030
Oyster flour	-	-	Calcium %	1.84	1.586
Vitamin* & min.	0.02	0.02			
Ronozyme **	+	+			
Lysine	-	-			
Total	100	100			

*Guaranteed levels of vitamin and minerals supplements per kg product: vit. A: 300.000 UI; vit. D_3: 100.00 UI; vit. 4.00mg; vit K: 98 mg; vit. B2: 1.320MG; vit. B12: 4.000mg; pantothenate: 2.000mg; niacin: 20.000mg; folic acid: 100 mg; choline: 50.000 mg; copper: 15.000 mg; iodine: 250mg; selenium: 50 mg; manganese: 24.000mg; zinc: 20.000 mg; iron: 10.000mg; coccide: 25.000mg; antioxidanta; 125mg and vehicle q.s.p: 1.000g.

**Ronozyme obtained from F. Hoffmann La Roche AG (4070 Basel, Switzerland) distributed by Rovigypt for Manufacturant Fed Product Egypt. – Cairo

Ration ingredients were sorghum, sesame cake, groundnut cake, and wheat bran Microbial phytase 0, and 750 FYT/Kg was added to the basal diet formulae. Experimental diets were fed for 42 days.

Sampling and Analyses

Average body weights, weight gain and feed consumption (g) for each group were determined weekly throughout the experimental period, meanwhile, health of the experimental stock and mortality were closely observed. Serum was analyzed for concentration of total protein, cholesterol, lipids, and triglyceride. following the procedure **Mohammad (1997).** The experimental diets, bone, manure and meat samples were proximately analyzed according to **AOAC (1995).** The sensory panel evaluated the chops for tenderness, flavor, color and juiciness using an eight-point scale; following recommended the procedure **(Hawrysh *et al.*, 1980).**

Statistical examination of the data was performed using the analysis of variance using Least Significant Difference (LSD) procedures of SAS **(SAS Institute. 1997)** was used to separate significant differences refer to the 5% level of probability.

RESULTS AND DISSCUION

The effect of feeding different levels of dietary microbial phytase on performance of broiler chicks is shown in **Table 2.** Treatment effect in all performance entities was significant (P> 0.05) lest for initial weight. Mean values for final weight, body weight gain and final weight were similar (P> 0.05).Test group daily feed intake, daily dry matter intake ,daily energy intake and feed conversion ratio mean values were significant (p<0.05) than the control values. Performance was shown to be significant on feeding CP% and nP% and records were increasing values in WG, FI and FCR.

Table .2 Analyses of variance and average (mean ± st.dev) performance values of broiler chicks fed0.30% 0.45% nP, 23% CP with different levels of phytase for 42day

	nP 0.45%		**nP 0.30%**	
Phytase (FYT)	**0**	**750**	**0**	**750**
	Mean± standard deviation			
	CP 23%			
Initial weight	45.00±0.00	45.00±0.00	45.00±0.00	45.00±0.00
Final weight	1881.10 ^{a}±92.36	1988.86 ^{a}±92.36	1777.53 ^{a}±92.53	1810.53 ^{a}±92.5
Weight gain	1839.1 ^{a}±92.53	1946.9 ^{a} ±92.53	1822.53 ^{a}±92.36	1855.53 ^{a}±92.4
Daily feed intake (g)	97.87 ^{a} ±0.21	86.30^{b} ±0.24	97.88 ^{a}± 0.21	86.30 ^{b} ± 0.24
Daily D.M. intake (g)	92.00 ^{a} ±0.65	81.12 ^{b} ±0.81	84.64 ^{a}±0.56	74.69 ^{b}±0.81
Daily energy intake (g)	84.64 ^{a} ±0.21	74.63 ^{b} ±0.20	92.00 ^{a}±0.21	81.12 ^{b} ±0.20
Feed conversion ratio	2.73 ^{a}±0.51	01.97 ^{b}±00.51	2.7326 ^{a}±0.343	1.9707 ^{b} ±0.343

Means in the same row bearing different superscripts differ significantly (p<0.05).

This result is supportive to that recorded by many researchers that supplementation of phytase enhanced performance. **Ravindran *et al.*, 2001; and Tao *et al.*, 2003** both found the addition of phytase illegible to improve performance. Also **Tossenberger *et al*, (1999)** revealed that

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supplementation with phytase enzyme increased the performance of birds even when dietary phosphorous content was abridged. **Pettersson *et al.* (1990)** studied the effect of enzyme supplementation on the performance of broilers fed diets containing either 19.2 or 22.7 CP %. **Namkung and Leeson (1999)** suggest that diet with supplemental phytase had a higher AME_n ($P \leq 0.01$) compared with the control diet. Chicks fed phytase had higher digestibility for Val, Ile, nonessential amino acids ($P \leq 0.05$), and total amino acids

The change in the concentrations of serum metabolites of broiler chicks is shown in **Table 3.** The dietary phytase treatment effect in all serum metabolites was significant ($P< 0.05$). Mean values in total protein, cholesterol and lipids of treatment groups were similar ($P> 0.05$) except for the triglycerides ($P< 0.05$). Test group mean values for cholesterol and triglyceride were higher ($p>0.05$) compared to control.

Table .3 Analysis of variance and average (mean ± st.dev) serum metabolites values of broiler chicks fed 0.45% nP, 23% CP with different levels of phytase for 42days

	nP 0.45%		**nP 0.30%**	
Phytase (FYT)	**0**	**750**	**0**	**750**
	Mean± standard deviation			
	CP 23%			
Total protein (g %)	7.30[a] ±0.82	7.50[a] ±0.82	07.30[a] ±00.65	07.50[a] ±00.65
Cholesterol (mg %)	125[a] ±21.35	120[b] ±21.35	119.00 [b]±00.65	125.00[a] ±0.65
Triglyceride (mg %)	106[a] ±0.088	105[b] ±0.088	100.00[b] ±00.65	103.80[a]±00.65
Lipids (mg %)	7.60[a] ±0.65	7.50[b] ±0.65	07.54[a] ±00.65	07.53[a] ±00.65

Means in the same row bearing different superscripts differ significantly ($p<0.05$)

The results obtained for the slaughter and carcass data were exposed in **Table 4.** Treatment effect was significant ($p<0.05$) in all carcass and slaughter parameters except for liver and heart percentages. Mean slaughter weight of the test group (1988.86 ±6.79) was significantly ($p<0.05$) different from the control.

Table.4 Analysis of variance and average (mean ± st.dev) slaughter and carcass values of broiler chicks fed 0.45% nP, 23% CP with different levels of phytase for 42 days.

	nP 0.45%		nP 0.30%	
Phytase (FYT)	0	750	0	750
	Mean± standard deviation			
	CP 23%			
Slaughter weight	1881.10 [b] ±6.80	1988.86 [a] ±6.79	1488.90 [b] ±7.09	1600 [a] ±7.086
Hot carcass wt.	1316.77[a] ±148.62	1414.47 [a]±148.62	1242.75 [a] ±121.3	1328.29 [a] ±121.3
Cold carcass wt.	1328.77 [a] ±121.3	1427.47 [a]±121.34	1229.57 [a] ±148.61	1305.29 [a] ±148.61
Shrinkage %	0.36 [a]±0.4	0.35 [a]±0.1	0.33 [b]±0.04	0.81 [a]±0.01
Hot dressing%	69.00 [a] ±6.80	69.12 [a] ±6.80	68.91 [a] ±6.80	69.16 [a] ±6.80
Cold dressing%	68.64 [a] ±6.80	68.77[a] ±6.80	68.48 [a] ±6.80	68.35 [a] ±6.80
Liver%	3.22 [a] ±6.80	3.25 [a] ±6.80	2.76 [a] ±7.086	3.96 [a] ±7.086
Heart%	0.45 [a] ±.086	0.46 [a] ±.086	0.47 [a] ±00.08	0.48 [a] ±00.08
Gizzard%	3.70 [a] ±.086	3.75 [a] ±.086	3.26 [a] ±00.08	4.46 [b] ±00.08
Breast	41.60 [a] ±6.80	40.86 [a] ±6.80	41.70 [a] ±7.086	40.08 [a] ±7.09
Thigh%	31.55 [a] ±7.086	31.30 [a] ±7.086	31.23 [a] ±6.80	30.41 [a] ±6.80
Total edible part%	79.22 [a] ±7.086	78.62[a] ±7.086	77.52 [a] ±7.086	71.91 [a] ±7.086

Means in the same row bearing different superscripts differ significantly (p<0.05).

Test group mean values in remaining parameters were higher (p>0.05) than the control except for the breast and total edible parts percent (p>0.05). Test group mean values for slaughter weight, shrinkage% and gizzard were higher (p<0.05) than the control. Test group mean values for the remaining were similar (p>0.05). The present treatment had significantly increased slaughter and carcass total edible parts in test groups. This result agrees with the findings of **Scheiddeler and Ferket (2000) and El Medany and El-Afifi (2002)** who reported that phytase supplementation had effect on total carcass edible parts. However, the groups fed diets supplemented with phytase, normal plane CP and low nP level, gave better carcasses than other groups.

Results of tibia bone qualities were seen in **Table 5**. Treatment effect was significant (p<0.05) in all tibia values. Test mean values for tibia bone length and tibia bone breaking strength was higher (p>0.05) than the control. Mean value for tibia width was similar (p>0.05) to the control. Other experiment mean test group values for tibia length, tibia width were similar (p>0.05) to the control group. Test group mean values for tibia-breaking strength was higher (p<0.05) compared to control.

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Results of tibia bone measurements based on the dietary phytase treatment effect were significant. Bone quality measurements improved in test chicks having the dietary phytase **Puzio (1999)** suggested that phytase supplementation in chicken increased utilization of phosphorous and increased likewise maximum strength, maximum elasticity and stiffness and bone mineral density.

Table .5 Analysis of variance and average (mean ± st.dev) tibia values of broiler chicks fed 0.45% nP, 23% CP with different levels of phytase for 42 days

	nP 0.45%		**nP 0.30%**	
Phytase (FYT)	**0**	**750**	**0**	**750**
	Mean± standard deviation			
	CP 23%			
Tibia length (Tl) cm.	7.00^{b} ±0.08	7.31^{a} ±0.08	6.53^{a} ±0.65	7.20^{a}±0.65
Tibia width (TW)cm.	0.57^{a} ±0.09	0.63^{a} ±.09	00.64^{a} ±0.076	0.65^{a} ±0.076
Tibia breaking strength (TBS) kg.	23.70 ^{b}±0.65	29.80^{a} ±0.65	26.40^{b} ±1.89	35.00^{a} ±1.89

Means in the same row bearing different superscripts differ significantly ($p<0.05$).

Cristiane *et al*., (2003) confirmed that increasing calcium level significantly affected the weight and thickness of the tibia meshes in avian strains. Bone breaking strength on diets with added phytase had much higher breaking point than in birds fed no phytase. This obtained result was in agreement with **Ribeiro *et al*., (2003)** who suggested that the negative impact on bone strength associated with low dietary levels of nP and Ca was completely reversed by the inclusion of phytase which has then improved bone mineral content and increased both bone density and bone strength**.**

Results of tibia mineral analysis were shown in the **Table 6** Treatment effect in all tibia chemical analyses was significant ($p<0.05$). Test mean values for tibia phosphorous, sodium, calcium and ash, were similar ($p>0.05$) to the control.

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Table.6 Analysis of variance and average (mean ± st.dev) tibia mineral values of broiler chicks fed 0.45% nP, 23% CP with different levels of phytase for 42 days

	nP 0.45%		nP 0.30%	
Phytase (FYT)	0	750	0	750
	Mean± standard deviation			
	CP 23%			
Dry Matter	92.60 ±0.65 [b]	94.97 [a]±0.65	95.20 [a] ±. 1.89	94.56 [a]±1.89
Phosphorous	0.50 ±0.08 [a]	0.46 [a]±0.08	0.510 [a] ±. 076	0.49 [a] ±076
Sodium	1.64 ±0.08 [a]	1.53 [b]±0.08	1.620 [a] ±. 076	1.62 [a]±076
Calcium	13.13 ±1.90 [a]	13.07 [b] ±1.90	12.40[a] ±0.65	12.30 [a] ±0.65
Ash	48.58 ±0.65 [a]	48.80 [b] ±0.65	47.90 [a] ±1.89	47.98 [a]±1.89

Means in the same row bearing different superscripts differ significantly ($p<0.05$)

The test group mean value in dry matter was higher ($p<0.05$) than the control group. Treatment effect in all tibia chemical analyses was significant ($p<0.05$)**.** **Lan *et al.*, (2002)** reported that dietary addition of microbial phytase increased Zn deposition in bone tissue

Values for broilers meat chemical composition reported in this study for different dietary treatments conform to literature, and also in the subjective quality values in juiciness, flavor, tenderness and color, all being at moderate values. **(Stadelman *et al.*, 1988)** consistently thigh meat, which is inherently higher than breast meat in fat, rated higher than the breast in juiciness. **(Lindsay, 1985)** Many flavor components of poultry are fat soluble, and would be more abundant in the thigh meat than the breast meat.

The mineral phosphorous availability is shown in **Table 7.** Treatment effect in all phosphorous availability measurements was significant ($p<0.05$). Test mean values for P consumptions, total manure excreted, total P retained and total P retention % values were higher ($p>0.05$) than the control. Test group mean value for total P excreted was similar ($p>0.05$) in value compared to the control.

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Table.7Analysis of variance and average (mean ± st.dev) phosphorus availability of broiler chicks fed 0.45% nP, 23% CP with different levels of phytase for 42 days.

	nP 0.45%		nP 0.30%	
Phytase (FYT)	0	750	0	750
	Mean± standard deviation			
	CP 23%			
Total feed consume (g)	4110.60 ^{a} ±56.86	3624.40±51.05 ^{b}	4110.6 ^{a} ±56.86	3624.4 ^{b} ±0.05
Total P consume (mg)	3193.01 ^{b} ±85.44	3621.44 ^{a} ±85.44	1076.81 ^{b} ±85.4	1221.259 ^{a} ±85.4
Total manure excretion (g)	1087.32 ^{b} ±10.69	1223.18 ^{a} ±15.37	798.17 ^{b} ±10.69	858 ^{a} ±10·69
Total P excreted (mg)	645.64 ^{a} ±186.67	611.59 ^{a} ±186.67	239.45 ^{a} ±43.6	171.60 ^{b} ±4.61
Total P retained (mg)	2547.45 ^{b} ±108.69	3009.85 ^{a} ±108.69	837.36 ^{b} ±108.7	1049.67 ^{a} ±108.7
Total P retention (%)	79.78 ^{b} ±0.82	83.11 ^{a} ±0.82	77.76 ^{b} ±0.82	85.95 ^{a} ±0.82

Means in a row bearing different superscripts differ significantly ($p<0.05$)

Test means value for feed consumptions was lower ($p<0.05$) compared to the control. **Summers, (1992)** found that phytate phosphorous made significant contributions to phosphorous excretion due to its poor digestibility, and there were good opportunities to reduce phosphorous excretion in poultry, since about 75% of the consumed P ends up in the excreta. **Sautoh (2001)** showed that improving the nutrient digestibility through addition of enzymes reduced the amount of poultry excreta. Phytase supplementation improved phosphorous availability resulting in low phosphorous excretion. **(Tossenberger *et al.*, 1999 and Um *et al.*, 2000; Grabowicz *et al*,. 2002 and Ravindran *et al*., 2008)** found that supplementation of microbial phytase in poultry diets significantly increased phosphorous digestibility, and phosphorous content in the control birds' excreta varied between 0.30-0.38 % and that was significantly higher than its content in the test birds' droppings. **Tao *et al.*, (2003)** reported that phytase supplementation increased relative retention of minerals and decreased excreta content of total phosphorous. **Keshavarz(2000)** attributed, beneficial effects of phytase on performance could have been due to increasing the digestibility and availability of some nutrients, other than phytate P, that might have been limiting in the diets.

The mineral calcium availability is cited in **Table 8** Treatment effect in all calcium availability measurements was significant ($p<0.05$). Test group mean values of total Ca consumption and total Ca retention% were higher ($p<0.05$) in value compared to the control. Test group means values for total manure excreted, total Ca excreted and total Ca retention was similar (p>0.05). Test means value for total feed consumptions was lower (p<0.05) compared to the control. **Cristiane *et al.*, (2003)** using phytase for broiler growth, had evaluated the effects of amino acid and calcium levels.

Table .8 Analysis of variance and average (mean ± st.dev) calcium

	nP 0.45%		nP 0.30%	
Phytase (FYT)	0	750	0	750
	Mean± standard deviation			
	CP 23%			
Total feed consume (g	4110.60 ^{a}±56.86	3624.40 ^{b}±0.05	4110.6 ^{a} ±56.86	3624.4 ^{b} ±0.05
Total Ca consume (mg)	6668.89 ^{b}±123.4	7563.504 ^{a} ±123.4	6748.92 ^{a} ±45.7	6520.27 ^{b} ±27.87
Total manure excrete (g)	1087.32 ^{a}±153.5	1223.18 ^{a} ±153.49	798.17 ^{b} ±6.82	858 ^{a} ±6.82
Total Ca excreted (mg)	1768.59 ^{a} ±343.8	1598.17 ^{a} ±343.83	1239.78 ^{a}±290.17	962.39 ^{b} ±290.17
Total Ca retained (mg)	4900.31 ^{a} ±565.2	5965.34 ^{a} ±565.24	5509.15 ^{a}±565.24	5557.88 ^{a}±565.24
Total Ca retention (%)	73.48 ^{b} ±0.86	78.87 ^{a} ±0.47	81.63 ^{b} ±0.86	85.24 ^{a} ±0.47

availability of broiler chicks fed 0.45% nP, 23% CP with different levels of phytase for 42 days

Means in a row bearing different superscripts differ significantly (p<0.05)

on bone mineralization. They observed that neither factor ultimately affected bone development. These investigators also stated that birds with a high growth rate are more susceptible to deficiency on diets containing low calcium levels, ending in inadequate mineralization, which is expressed in lower bone densities. This prevall probably due to the starter bird high growth rate compared to finisher ones. **Lan *et al.*,(2002)** Supplementation of AMJC significantly increased (P < 0.05) the AME value, digestibility of DM and CP, and retention of P, Ca, and Cu but significantly decreased (P < 0.05) excretion of P by broiler chickens.

Major inputs and margin over inputs (SDG) of different dietary treatments of broiler chicks were shown in **Table 9.**

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Table.9 Major Inputs and margin over major inputs (per head) of broiler chicks fed 0.45% nP, 23% CP with different levels of phytase for 42 days

	nP 0.45%		nP 0.30%	
Phytase (FYT)	**0**	**750**	**0**	**750**
	Mean± standard deviation			
	CP 23%			
Meat sales (SDD)*	1227.272	1292.759	1155.395	1176.845
Chick purchase (SDD)	185.00	185.00	185.00	185.00
Feed cost (SDD)**	180.85	159.46	177.503	137.368
Major cost of production	515.85	494.46	512.503	472.368
Margin over major inputs	711.422	798.299	642.89	704.477
Profitability	57.97	61. 75	55.64	59.86
Profitability ratio	1.00	1. 065	1.00	1.076

*At (April'2004) prices of meat 650 SDD/ kg.($USA=263(SDD)Sudanese Dinar)

**At (April'2004) price of mash 43.9955 SDD/ kg.

Chick purchase and Feed cost values (SDD) were the major inputs considered. Chick purchase and Feed cost values (SDD) were the major inputs considered. The total selling values of meat is the total income obtained. *Profitability ratio= Profitability of supplemented/ Profitability of control*. Profitability ratio (1.076) of the test group (750 FYT/U) was higher than the control group. Economic wise, the addition of phytase could make reasonable profits than without. The profitability element here is based on feed, as it constitutes more than 60% of the ration cost for poultry feeding. Further benefits lie within the improvement of digestibility and consequent better utilization of nutrients. It was assumed always that in this and similar studies, purchases of stock are equal and good if management is similarly run. Margins differences only lies in gains achieved. In intensive and large scale poultry production, minor inputs and good management always proved critical. **Cowieson and Adeola (2005)** Furthermore, there may be an additive of phytase that is highly effective in improving the performance of broilers, allowing for the formulation of lower-cost diets and contributing to the profitability of the production of poultry products.

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