Effect of a high dose of phytase on broiler performance based on a 3-trial meta-analysis. Vitor Barbosa Fascina*, José Otávio Berti Sorbara, Keyzuke Muramatsu, and Rafael Gustavo Hermes, DSM Nutritional Products, São Paulo, São Paulo, Brazil.

The objective of this study was to evaluate the effect of a high-dose inclusion of phytase (RONOZYME HiPhos GT, DSM Nutritional Products) on broiler performance. Three experiments were conducted between April 2015 and February 2016 in Brazil using meta-analysis. Corn/SBM diet (positive control diet, PC) was formulated to contain all nutrients, following the recommendations of the Brazilian Tables (2011). In all trials, a total of 3,300 slow-feathering, Cobb 500 male broilers were randomly distributed to 5 treatments (Trt) with 8 replicates (in 2 trials) and 12 replicates (in one trial). Treatments consisted of PC; negative control (NC) with Ca (−0.12% n = 1; −0.15% n = 2) and available P (ap) reduction (−0.14% n = 1; −0.15% n = 2); NC + 1,000 FYT/kg feed; NC + 2,000 FYT/kg feed; and NC + 3,000 FYT/kg feed. Data were used in a meta-analysis conducted as a complete randomized design using the MIXED procedure of SAS (SAS Institute, 2002). The model included Trt (n = 5) as a fixed effect and trial (n = 3) as a random effect. Regressions were done on the effect of phytase levels (NC, NC + 1,000, 2,000, and 3,000 FYT/kg) on performance measures. Feeding the PC and phytase supplementation Trts improved weight gain (WG) and adjusted feed conversion ratio (adjusted for 2.5 kg of body weight, FCRadj) (P < 0.0001) when compared with NC. Based on regression analysis, phytase increased WG up to an inclusion of 2,424 FYT/kg and 2,269 FYT/kg at 21 and 40 d, respectively (WG21d = 795.79644 + 0.0625497x − 0.0000129x²; R² = 0.79; WG40d = 2533.018254 + 0.190604x − 0.000042x²; R² = 0.85). In conclusion, the inclusion of a high dose (2,100 to 2,450 FYT/g) of the tested phytase resulted in improved performance over the NC, and same performance of PC.

Key Words: feed conversion ratio, feed cost, phosphorus, weight gain


The aim of this research was to evaluate the effect of phytase superdosing on broiler performance with diets containing 7% rice bran. A total 936 male broilers ( Cobb) were distributed in a randomized experimental design with 4 treatments and 9 replications of 26 birds per experimental unit. The diets were: positive control (PC, formulated to meet or exceed bird nutritional requirements) without phytase; negative control (NC), reduction of 0.192% Ca and 0.175% avP levels when compared with PC diet; and NC diet supplemented with 750 or 1500 FTU/kg phytase. Water and feed were supplied ad libitum throughout the experimental period. Rice bran was included by 7% to increase phytate P levels in all diets. The evaluated parameters were feed intake (FI), feed conversion ratio (FCR) and body weight gain (BGW) determined at 1 to 42 d of age, whereas carcass (CY), breast (BY), thigh and drumstick yield (TDY) were determined in 2 birds per pen at 42 d of age. The results are shown in Table 1. The data were analyzed by ANOVA and Tukey test at 5% probability level. The inclusion of phytase in broiler diet provided higher FI compared with the NC. However, the PC achieved the same performance (BGW and FCR) of treatment with 1500 FTU/kg phytase, probably because of the P levels available in the diet (PC) were sufficient to meet the nutritional requirements of production animals. There was no effect (P > 0.05) of phytase levels on CY, BY nor TDY. Therefore, the inclusion of high levels of phytase in diets containing 7% rice bran was efficient for the productive parameters.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>FI (g)</th>
<th>BWG (g)</th>
<th>FCR</th>
<th>CY (%)</th>
<th>BY (%)</th>
<th>TDY (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP</td>
<td>5,101a</td>
<td>2,982a</td>
<td>1.71a</td>
<td>79.71</td>
<td>36.10</td>
<td>24.82</td>
</tr>
<tr>
<td>CN</td>
<td>4,793b</td>
<td>2,734bc</td>
<td>1.75ab</td>
<td>78.58</td>
<td>37.07</td>
<td>28.29</td>
</tr>
<tr>
<td>CN+750</td>
<td>5,071a</td>
<td>2,874b</td>
<td>1.76a</td>
<td>79.34</td>
<td>36.21</td>
<td>28.06</td>
</tr>
<tr>
<td>CN+1500</td>
<td>5,013a</td>
<td>2,894ab</td>
<td>1.73bc</td>
<td>80.21</td>
<td>36.98</td>
<td>28.67</td>
</tr>
<tr>
<td>P-value</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.133</td>
<td>0.574</td>
<td>0.373</td>
</tr>
<tr>
<td>CV (%)</td>
<td>3.45</td>
<td>4.10</td>
<td>1.66</td>
<td>1.80</td>
<td>4.79</td>
<td>18.40</td>
</tr>
</tbody>
</table>

*Different letters in the columns differ by Tukey test at 5% probability.

Acknowledgments: AB Vista

Key Words: body weight, carcass yield, feed intake, phosphorus, phytase

Levels of phytase on broiler performance and carcass characteristics. Lucas Barrilli*, Thiago Cancelli1, Simone Gisele Oliveira1, José Otávio B. Sorbara2, and Vitor Barbosa Fascina2.1 Federal University of Paraná, Curitiba, Paraná, Brazil, 2DSM Nutritional Products, São Paulo, São Paulo, Brazil.

The aim of this study was to evaluate broiler performance and carcass yield fed corn-soybean meal diets and supplemented with phytase. A total 880 broiler chick males Cobb 500 were randomly distributed in 5 treatments with 8 replicates and 22 birds each one. Treatments were a Positive control diet (PC); Negative control diet (−0.15% Ca and 2aP) (NC); NC + 1,000 FYT/kg feed (RONOZYME HiPhos GT, DSM Nutritional Products); NC + 2,000 FYT/kg feed; and NC + 3,000 FYT/kg feed. Feed intake (FI), body weight gain (WG) and adjusted feed conversion ratio (adjusted for 2.7 kg of body weight, FCRadj) were evaluated. Also, it was evaluated carcass yield and cuts (breast and thigh+drumstick), and abdominal fat percentage of 3 birds with average weight of experimental unit (+/−5%). Data were submitted to ANOVA, and means were compared by Tukey test (P < 0.05). Regression equations were estimated (P < 0.05) according to phytase levels and negative control diet. The phytase supplementation and PC improved the WG (2,610...
Extra-phosphoric effect of phytase on broiler performance from 1 to 21 days. 

The use of exogenous enzymes in non ruminant diets has been shown to be an important alternative in reducing the negative effects of anti-nutritional factors of food used in diets formulations. The inclusion of phytase in poultry diet has effective capacity to increase the availability of phosphorus. The objective of this study was to evaluate the extra-phosphoric effect of phytase on performance of broilers from 1 to 21 d old.

290 broiler chicks were assigned in a completely randomized design to 4 treatments, 9 replicates of 26 birds each. Treatments comprised a positive control (PC), a negative control (NC) (no enzyme, and reduction of 0 – 192% Ca and 0 – 175% P), and 2, RONOZYME HiPhos GT 200 ppm; T3: NC + 3000 FYT/kg RONOZYME HiPhos GT 300 ppm). Variables analyzed were weight gain (WG), feed intake (FI) and feed:gain (FG). The data were submitted to ANOVA to compare means by Tukey (P < 0.05), and subsequent regression analysis excluding T1 (0% phytase). The performance was better (P < 0.05) for the PC treatment and those with phytase inclusion (1000, 2000, and 3000 FYT/kg) than for birds in the NC group. The WG showed a quadratic (P < 0.05) response (WG = 797.398 + 0.0639312 × phytase – 0.0000107528 × phytase²; R² = 0.69), estimating a value of 893 g of WG when using the level of 2973 FYT/kg of diet. There was a linear response in FI and FG according to increase in phytase inclusion (FI = 1187.58 + 0.026021 × phytase; R² = 0.35; FG = 1.466959 + 0.000023009 × phytase; R² = 0.29). At 21 d of age, the phytase inclusion increased chicken performance remained similar to PC. The great phytase level from 1 to 21 d of age is 2973 FYT/kg of diet.

Key Words: exogenous enzyme, extra phosphoric effect, nutrition, phytate, poultry

Table 1. Effects of the treatment on apparent digestibility coefficients ileal of dry matter (DM), crude protein (CP), digestible energy (DE) and concentration of sialic acid (SA) content ileal in broilers at d 21

<table>
<thead>
<tr>
<th>Treatments</th>
<th>DM</th>
<th>CP</th>
<th>GE</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP</td>
<td>60.63bc</td>
<td>77.71a</td>
<td>67.75bc</td>
<td>2.81b</td>
</tr>
<tr>
<td>CN</td>
<td>57.46c</td>
<td>73.15b</td>
<td>64.91c</td>
<td>2.90ab</td>
</tr>
<tr>
<td>CN+750</td>
<td>62.93ab</td>
<td>78.24a</td>
<td>68.53ab</td>
<td>2.83b</td>
</tr>
<tr>
<td>CN+1500</td>
<td>65.31a</td>
<td>79.62a</td>
<td>70.76a</td>
<td>3.13a</td>
</tr>
<tr>
<td>P-value</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>CV^</td>
<td>6.25</td>
<td>4.05</td>
<td>4.47</td>
<td>10.18</td>
</tr>
</tbody>
</table>

Key Words: crude protein, digestibility energy, dry matter, phytase, superdosing

Dietary supplementation of phytase and 1-α-hydroxycholecalciferol for broilers. 

Key Words: 1-α-hydroxycholecalciferol for broilers.
This study was carried out to evaluate the effect of dietary supple-
mentation of phytase and vitamin D₃ (1α-hydroxycholecalciferol) on
performance and carcass yield for broilers. A total of 630 Cobb 500
male broiler chicks were assigned to 6 dietary treatments, consisting of
7 pens of 15 birds each, and were fed experimental diets from 1 to
42 d of age. The experimental treatments were: A = negative control
(50% of Ca and P recommended by Rostagno et al., 2011); B = Ca e P
recommended by Cobb 500 manual (2011); C = Ca e P recommended
by Rostagno et al., 2011; D = negative control + Phytase; E = negative
control + aD₃; F = negative control + aD₃ + Phytase. Basal diets were
formulated to contain corn and soybean meal. Data were analyzed using
the GLM procedure of SAS appropriate for a completely randomized
design. Feed intake (FI), body weight gain (BWG), and feed conver-
sion ratio (FCR) were evaluated. At 42 d, birds were selected, fasted
for 12 hrs, slaughtered and their carcasses yield and cuts (breast and
legs) evaluated. FI was not affected by treatments from 1 to 42 d (P >
0.05), however; BWG was increased for treatments B, E and F when
compare with the others (P < 0.05). In addition, FCR was improved for
treatments E and F when compare with treatments A and D (P < 0.05).
No difference was observed for carcass yield and cuts (P > 0.05). We
concluded it is possible to reduce 50% of Ca and P in the diet, however;
supplementation with vitamin D₃ (1α-hydroxycholecalciferol) with or
without phytase is required.

Key Words: calcium, enzyme, phosphorus, vitamin D₃

Phytase enzymes have been shown to increase digestibility of P, Ca,
energy and amino acids, allowing reduced total levels of these nutrients
in feed formulation. However, the amount whereby dietary Ca should
be reduced when adding phytase is not well understood and was the
objective of this study. Four treatments (TRT) included a positive control
(PC) formulated to the recommendations for the breed. A basal diet was
made without inorganic Ca and P supplements and reductions of 68
kcal ME/kg, 0.02% dig AA and 0.03% Na vs PC. This basal diet was
supplemented with Buttiauxella sp. phytase at 1000 FTU/kg, DCP and
limestone, to provide 3 TRT with 0.174% less AvP and either 0.159,
0.02% dig AA and 0.03% Na vs PC. This basal diet was
formulated to contain corn and soybean meal. Data were analyzed using
the GLM procedure of SAS appropriate for a completely randomized
design. Feed intake (FI), body weight gain (BWG), and feed conver-
sion ratio (FCR) were evaluated. At 42 d, birds were selected, fasted
for 12 hrs, slaughtered and their carcasses yield and cuts (breast and
legs) evaluated. FI was not affected by treatments from 1 to 42 d (P >
0.05), however; BWG was increased for treatments B, E and F when
compare with the others (P < 0.05). In addition, FCR was improved for
treatments E and F when compare with treatments A and D (P < 0.05).
No difference was observed for carcass yield and cuts (P > 0.05). We
concluded it is possible to reduce 50% of Ca and P in the diet, however;
supplementation with vitamin D₃ (1α-hydroxycholecalciferol) with or
without phytase is required.

Key Words: calcium, enzyme, phosphorus, vitamin D₃

63 An evaluation of incremental dietary calcium reduction
on Buttiauxella sp. phytase efficacy in broilers. Luis F. Romero*,1,
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isco Animal Nutrition, DuPont Industrial Biosciences, Marlborough,
UK, 1The University of Queensland, Gatton, Australia, 2University of
Pretoria, Pretoria, South Africa.

Phytase enzymes have been shown to increase digestibility of P, Ca,
energy and amino acids, allowing reduced total levels of these nutrients
in feed formulation. However, the amount whereby dietary Ca should
be reduced when adding phytase is not well understood and was the
objective of this study. Four treatments (TRT) included a positive control
(PC) formulated to the recommendations for the breed. A basal diet was
made without inorganic Ca and P supplements and reductions of 68
kcal ME/kg, 0.02% dig AA and 0.03% Na vs PC. This basal diet was
supplemented with Buttiauxella sp. phytase at 1000 FTU/kg, DCP and
limestone, to provide 3 TRT with 0.174% less AvP and either 0.159,
0.189, and 0.234% less Ca (low, medium and high Ca reduction) vs PC.
Inert filler was used to maintain the same ingredient composition in all
phytase TRT except DCP and limestone. Male Ross 308 broilers were
placed in 8 replicate pens of 37 birds in a randomized complete block
design. Test diets were pelleted and fed ad libitum for 42 d. Twelve birds
on d 10, and 6 birds on d 10, 21, and 35 were euthanized to measure tibia
ash and ileal and fecal nutrient digestibility using AIA as marker at 10,
21 and 35 d. Treatment effects were tested by GLM model using SAS
with significance at P < 0.05. High Ca reduction resulted in higher ileal
P digestibility at d 10 and 35 compared with PC and low Ca reduction.
Ileal and fecal Ca digestibility increased in a step wise manner at 35
d of age with incremental Ca reduction in the diets. Treatment had no
effect on tibia ash at 10, 21 and 35 d of age. At 42 d, the high Ca reduc-
tion resulted in greater tibia ash vs low Ca reduction diet. Birds fed diet
with phytase and high Ca reduction improved energy efficiency, using
191 kcal less energy to produce 1 kg live weight vs PC. Increasing Ca
reduction level in diets supplemented with phytase improved P and Ca
utilization, bone mineralisation and energy efficiency in broilers grown
to 42 d of age.

Key Words: broiler, Buttiauxella sp phytase, calcium, available P,
digestibility

64 Biochemical parameters of broilers fed a diet with low
available phosphorus and inclusion of bacterial phytase. T. S.
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Pizauro Júnior3, R. R. Colosio3, L. F. J. Santos3, and E. M. Muro1,
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São Paulo State University (UNESP), Jaboticabal, São Paulo, Brazil.

The use of phytase associated with low level of available phosphorus in
diet for broiler reduces the antinutritional effect of phytate and improves
utilization of phosphorus phytic. This study aimed to evaluate the effect
of 3 commercial bacterial phytases derived from Escherichia coli, on
plasma levels of calcium and phosphorus and serum alkaline phosphatase
of broilers at 35 d old. A total of 2,100 one-day-old male Cobb chicks
were housed in 70 pens in a completely randomized design in factor-
ial arrangement, and reared to 35 d old. Positive control* (PC*) and
negative control*(NC*) diets had nutritional value of phytase recom-
ended by the manufacturer practiced (0.12% available phosphorus)
relatively to positive control (PC) and negative control (NC) diets. The
factorial design was 2 × 4 + 2: 2 levels of available phosphorus (aP)
(CP* - 0.33% (1 to 21d) and 0.28% (22 to 35d) aP) and (CN* - 0.23% (1
to 21d) and 0.18% (22 to 35d) aP) × phytases (A, B, C, without) +
positive control (0.45% (1 to 21d) and 0.40% (22 to 35d) aP without
phytase) and negative control (0.35% (1 to 21d) and 0.30% (22 to 35d) aP
without phytase) totaling 10 treatments with 7 replicate pens. Inclusion
of phytase decreased the level of calcium and increased of phosphorus
in plasma of broilers fed diets CP* in comparison to broilers fed diets
CN*. Absence of phytase in diet CN* impaired the level of calcium and
phosphorus in plasma of broilers. There was intersection between level of
available phosphorus and inclusion of phytase (P < 0.05) for the activity
of alkaline phosphatase in serum showing increased activity of this
enzyme in broiler fed diets CN* without phytase, however the inclusion
of phytase decreased the activity of alkaline phosphatase in serum. This
experiment demonstrated it’s possible to reduce the available phosphorus
in diets CP* with inclusion of phytase and keep the normal plasma levels
of calcium and phosphorus and serum alkaline phosphatase.

Acknowledgments: To BrNova for donating of premix used in the

Key Words: plasma, serum, calcium, phosphorus