
Canola breeding program undertaken to improve meal quality has led to the development of canola quality (i.e., low glucosinolate, low erucic acid) form of *B. juncea*, a mustard species known for its pure yellow seed coat. Under Western Canadian conditions, *B. juncea* suffers less from heat and drought stress and matures earlier than *B. napus*. Such characteristics are the basis for high yields of oil and low chlorophyll content in the seed. The objective of the current study was to evaluate the chemical and nutritive composition of meals derived from pre-press solvent extracted seeds of the conventional black-seeded *B. napus* canola and the canola-quality yellow-seeded *B. juncea*. In comparison with *B. napus* canola, meal derived from yellow-seeded *B. juncea* contained (DM basis) similar amount of protein (41.7 vs. 41.5%) and fat (2.8 vs. 2.9%), more sucrose (6.9 vs. 5.6%), more starch (3.4 vs. 0.1%) and less dietary fiber (27.7 vs. 33.8%). Lower fiber content of *B. juncea* canola was reflected in lower content of lignin with associated polyphenols (4.0 vs. 10.4%). The nutritive value of canola meal was investigated with broiler chickens fed corn/soybean meal-based diets containing 30% of meals from 4 to 18 d of age. A significantly lower (*P < 0.05*) BWG was observed in birds fed the *B. juncea* diet when compared with those fed the conventional black-seeded *B. napus* canola (479 vs. 515 g/bird).

No difference in FCR was observed (1.44 vs. 1.42). In a second study, meal AMEn values for *B. juncea* and *B. napus* were determined with broiler chickens (from 14 to 19 d of age) and were 1881 and 1852 kcal/kg DM, respectively. Enzyme (multicarbohydrase) addition resulted in a greater (*P < 0.05*) AMEn value of 1993 kcal/kg DM for *B. napus* meal, with a more pronounced effect (*P < 0.05*) observed for *B. juncea* canola (from 1881 to 2222 kcal/kg DM).

Key Words: *B. juncea* canola, nutritive value, AMEn, broiler chicken, enzyme supplementation

40 Evaluation of a thermo-tolerant xylanase in low energy broiler diets. M. P. Williams1*, C. L. Wyatt1, T. W. York2, and J. T. Lee2, 1Poultry Science Department, Texas AgriLife Research, Texas A&M System, College Station, 2AB Vista Feed Ingredients, Chesterfield, MO. 3Foster Farms, Delhi, CA.

The objective of the current study was to evaluate the impact of feeding a thermo-tolerant xylanase (Econase XT) at variable levels in commercial broiler diets. The experimental design consisted of 3 energy levels: positive control (PC), negative control –66 kcal/kg (NC1), and negative control –132 kcal/kg (NC2); and 2 xylanase levels (included in the NC diets). Xylanase was added at either 60 g/ton throughout or 60 g/ton in starter/grower and 100 g/ton in the finisher/withdraw (Var) diets resulting in a total of 7 treatments. Each treatment (Trt) was replicated 8 times with 42 straight-run chicks (2,352 total broilers). Broilers were reared in floor pens through 45 d of age. The dietary program consisted of 5 phases; starter (1–15 d), grower 1 (16–23 d), grower 2 (24–31 d), finisher (32–38 d), and withdrawal (39–45 d). Parameters measured were body weight, feed conversion ratio (FCR), livability, carcass yield and fat pad yield as a percent of carcass. No significant (*P < 0.05*) differences between the Trts were found through d 38 for body weight, FCR and livability. At d 45 no differences were found between Trts for body weight and livability. However, reducing the dietary energy in the NC2 diet resulted in a significantly poorer FCR compared with the PC (*P < 0.05*). Addition of xylanase to the low energy diets resulted in an improvement in FCR with the biggest response found in broilers fed the NC2 diet with the Var xylanase level. On d 45, 4 male and 4 female broilers/replicate (448 total) were subjected to a 6 h feed withdrawal period and processed to obtain carcass and fat pad weights. Reducing the dietary energy level decreased (*P < 0.05*) the fat pad yield (% carcass) of broilers in the NC2 Trt compared with the PC. These data demonstrate the effectiveness of improving FCR in broilers when fed reduced energy diets with the inclusion of a thermo-tolerant xylanase.

Key Words: broiler, performance, energy, enzymes

41 Interactions of exogenous enzymes and direct-fed microbials on ileal starch, amino acid and total tract energy digestibility in broiler chickens. G. R. Murugesan* and M. E. Persia, Iowa State University, Ames.

A 3 × 4 factorial experiment was conducted using male Ross 308 chicks to understand the interactions of exogenous enzymes (EE) and direct-fed microbials (DFM) on ileal starch, amino acid (AA), and crude protein (CP) digestibility, as well as total tract nitrogen-corrected apparent metabolizable energy (AME) in broiler chickens. The 12 dietary groups were determined with 3 enzyme treatments (None, EE A, and EE B) and 4 DFM treatments (None, DFM 1, DFM 2, and DFM 3). Until d 14, chicks were provided a corn - soy - dried distillers with solubles basal diet, which was formulated to meet the industry standards. Chicks were randomly allocated based on body weight to the experimental units (EU) using a completely randomized design and assigned to experimental diets on d 15. Each treatment was comprised of 8 EU of 6 chicks. After an adaptation period of 5 d, excreta samples were collected for 48 h for AMEn analysis. On d 21, ileal digesta contents were collected to determine the ileal AA, CP (IAC) and starch digestibility. Overall, EE A, DFM 2, and DFM 3 increased (*P ≤ 0.05*) IAC digestibility when applied alone. The combination of DFM 3 with EE A, and DFM 2 with EE B, had positive effects (*P ≤ 0.05*), while the combinations of DFM 1 or DFM 2 with EE A had no effect on the IAC. In contrast, the combination of DFM 1 or DFM 3 with EE B reduced (*P ≤ 0.05*) IAC. Ileal starch digestibility was increased (*P ≤ 0.05*) by EE or DFM supplementation with the exception of the combinations of DFM 1 or 3 with EE B, which had no effect on starch digestibility. In general, EE A or DFM increased (*P ≤ 0.05*) AMEn. The combinations of DFM 3 with EE A, and DFM 1 or 3 with EE B, increased (*P ≤ 0.05*) AMEn compared with the control or either product applied alone, while the combination of EE B and DFM 2 decreased (*P ≤ 0.05*) AMEn compared with control fed birds. Overall, EE and DFM treatments resulted in positive effects on ileal AA, CP, and starch digestibility, and AMEn. Specific combinations of DFM and enzymes exhibited synergistic effects on AA digestibility or AMEn.

Key Words: broiler, enzyme, direct-fed microbials, energy
Phosphorus (P) is an important component in bone mineralization and bone strength in poultry. Much of the P in corn-soy diets is in the form of phytin-phosphorus and is not available to non-ruminants. Dietary phytase can be added to poultry diets to increase the amount of available phosphorus (aP) in diets and allow a decrease in dietary inorganic P inclusion. The objective of this trial was to obtain information on P-releasing efficacy of commercially available phytases fed to male turkeys. Commercial-strain male poults (960) were raised in a curtain-sided floor-pen house with 20 pens. Male poults (960) were raised in a curtain-sided floor-pen house with 20 pens. Pens were randomly assigned to 1 of 8 corn-soy based dietary treatments: Low aP (L), Medium aP (M), High aP (H), or 1 of 5 commercially available phytase enzymes added to the L diet [OptiPhos (Opt); Ronozyme (Ron); Phyzyme XP (Phyz); Natuphos (Nat); or Quantum (Quan)]. Phytases were added to the L diets at supplier’s recommendations for a 0.10% aP release. Calcium was held constant across treatments. Birds were fed typical rations: starter 1, starter 2, grower 1, grower 2, grower 3, and finisher 1. For starter 1 to grower 1 aP levels were: L = 0.5%, M = 0.6%, and H = 0.7%. The aP was decreased by approximately 0.1% increments each in grower 2, grower 3, and finisher 1. Diets containing phytase were analyzed to confirm enzyme activity. Body weight (BW), feed intake (FI), and feed conversion ratio (FCR) measurements were determined at 5, 10, 15, and 18 weeks of age and at 5, 15, and 18 weeks, legs were collected from 2 birds per pen to determine bone breaking strength and tibia ash (%TA). There was no consistent treatment effect of BW or FI and there was no difference in bone breaking strength. At 5 and 18 weeks FCR improved as aP increased (P < 0.02). At 18 weeks %TA increased as aP increased (P < 0.08). Birds fed Opt and Quan had reduced FCR at 18 weeks compared with those fed the L diet (P < 0.05). Based on this study, the addition of dietary phytase to low-phosphorus diets seemed to increase the available-phosphorus.

**Key Words:** phytase, enzyme, turkeys, low phosphorus, available phosphorus

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**43 In vitro evaluation of Ca and P digestibility of various Ca sources with the addition of phytase.**

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Calcium and P solubility and pH of 5 Ca sources were evaluated in an in vitro assay simulating the gastric and small intestinal phases of digestion. The Ca sources were mixed into corn/soy diets and included limestone, highly soluble marine Ca (HSC), whey, dicalcium phosphate (dical), and a control with no added Ca. Each diet was supplemented with 0 or 500 FTU/kg of phytase 1 (PHY1) or phytase 2 (PHY2). Diets were subjected to a gastric phase digestion, including pepsin with incubation times of 5, 10, or 20 min or the gastric phase and a small intestinal (SI) phase digestion, including pepsin and pancreatin with incubation times of 5, 10, 20, or 60 min. Soluble Ca and P in the supernatant was collected and analyzed. In addition, total Ca and P in the diets were analyzed. Significance is reported at P < 0.001. Interaction between diet and PHY was observed for Ca and P digestibility and pH in both the gastric and SI phase. In the gastric phase Ca digestibility was significantly higher with HSC and PHY2, and P digestibility was significantly increased by PHY in all diets except for dical. PHY1 significantly decreased pH in the limestone diet but had no effect on pH in other diets. Limestone and HSC significantly increased pH in the SI phase at 20 and 60 min, while pH increased in the other diets at 60 min, which resulted in an incubation time x diet interaction. The addition of phytase altered Ca and P solubility in this in vitro digestion assay. However, the magnitude of the response was dependent on Ca source, and HSC appeared to have the greatest Ca solubility in the presence of phytase. However, phytase did not influence P solubility in the presence of dical.

**Key Words:** in vitro, Ca source, mineral digestibility, pH

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**44 The effect of increasing levels of DDGS and NSPase inclusion on growth performance and ileal digestibility in young broilers.**

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The inclusion of exogenous enzymes in broiler diets to maximize feed efficiency and nutrient utilization is becoming a common practice. These enzymes may allow utilization of lower cost, lower quality feedstuffs in poultry, such as dried distillers grains solubles (DDGS). The purpose of this study was to examine the effects of increasing levels of DDGS and non-starch polysaccharide degrading enzymes (NSPase; Enspira) inclusion on broiler growth performance and ileal nutrient digestibility. The experimental design consisted of a 4 (0, 5, 10, and 15% DDGS) x 2 (enzyme inclusion) factorial yielding a total of 8 treatment groups with each treatment consisting of 8 replicates; each replicate pen included 5 one-day-old male broilers. Diets were fed for a period of 21 d with body weight and feed consumptions determined weekly. On d 22, ileal contents from all broilers within a replicate were collected and pooled to determine ileal digestibility of energy using titanium dioxide as indigestible marker. With regard to main effects, body weight was decreased (P < 0.05) with 15% DDGS inclusion as compared with the control diet. Feed conversion was also increased (P < 0.05) with 15% DDGS inclusion as compared with all other diets through 14 d of age. Inclusion of NSPase resulted in a 3% increase in body weight (P = 0.1). Inclusion of DDGS reduced (P < 0.05) ileal digestible energy at the 10 and 15% inclusion rates and the inclusion of the NSPase increased (P < 0.05) ileal digestible energy. An interaction was observed between DDGS concentration and NSPase presence regarding digestibility coefficients for energy. Increased energy digestibility coefficients (P < 0.05) were observed at all DDGS inclusion levels except the 10% inclusion rate. These data confirm the negative effects of high levels of DDGS inclusion and demonstrate the effectiveness of NSPase inclusion through increased ileal digestibility.

**Key Words:** broiler, enzyme, DDGS, energy, digestibility

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**45 The effect of wheat distillers dried grains with solubles fed with or without protease or β-mannase on the performance of turkey hen poults.**

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Pressure to reduce the use of fossil fuels has resulted in an increased dependency on the use of grains for ethanol production. Distillers dried...
grains with solubles (DDGS), a co-product from ethanol production, can be used in poultry diets, but little information is available on the use of wheat DDGS diets for turkeys. An experiment was conducted to investigate the effect of wheat DDGS on growth performance and gut measurements of turkey hen poults in a 2 × 3 factorial arrangement. Two basal diets formulated to meet or exceed nutrient requirements for Hybrid Converter turkey starter diets contained either 0 or 30% DDGS. The DDGS used in the diet formulation contained 35.9% protein and 4.57% fat. Each basal diet was divided into 3 portions and supplemented with no enzyme, protease (0.125 g/kg) or β-mannanase (0.5 g/kg). A total of 144, 7d old Hybrid Converter female turkey poults were randomly distributed to provide 4 birds for each of 6 replicate cages per treatment. There was no mortality in the study. There were no effects of treatments or interactions on feed intake from 7 to 21d. However, 30% DDGS inclusion (P < 0.05) improved 21d body weight and feed conversion ratio. The relative (to 21d body weight) empty proventriculus and gizzard weight, duodenal, jejunum, ileal and cecal length were not different due to DDGS and/or enzyme. There were significant main effects and interactions on AME determined for the diets, overall the highest energy determined was for 30% DDGS with no enzyme (i.e., enzymes did not significantly improve 30% DDGS diets) and lowest for 0% DDGS with no enzyme (enzymes significantly improved AME of 0% DDGS diets). In conclusion, wheat DDGS can be incorporated in the turkey starter diet as high as 30% without detrimental effects on performance. The data failed to demonstrate a benefit of exogenous protease and β-mannanase enzyme on turkey performance regardless of the inclusion of DDGS.

Key Words: wheat, distillers dried grains with solubles, turkey, protease, β-mannanase

46 Difference in in vivo efficacy of two 6-phytases in young broilers. C. Kwakernaak†, J. D. Van der Klis†, and P. W. Plumstead‡, †Schothorst Feed Research, Lelystad, The Netherlands, ‡Danisco Animal Nutrition, Marlborough, United Kingdom.

Phytases are supplemented to poultry diets to hydrolyze phytate, improve nutrient digestibilities, decrease P excretion and decrease feed cost. Phytase is added to diets based on standardized phytase units (FTU) determined in vitro by the AOAC method. However, in vivo efficacy may differ between phytases. A new 6-phytase derived from Buttiauxella spp. and expressed in Trichoderma has been developed. The objective was to test if this new phytase has a different efficacy in vivo than a current commercial E. coli-6-phytase expressed in P. pastoris for young turkeys. Nine experimental diets were fed as pellets to BUT big 6 male turkeys housed in 6 replicate cages, 16 birds per cage from 5 to 21 d of age. A low P diet (negative control, NC) with 2700 kcal/kg AME _, (broiler), 284 g/kg CP, 5.6 g/kg P, 2.6 g/kg retainable P, 3.0 g/kg phytate-P, and 8.0 g/kg Ca was used. The phytase products and diets were analyzed for in vitro phytase activity according to the AOAC method by LUFA, Oldenburg, Germany. The new phytase was added at 350, 690, 1040 and 1380 FTU/kg on top of the NC diet. The E.coli-6-phytase was added at 390, 770, 1160 and 1540 FTU/kg. Feed and water were freely available. Performance was measured and at the end of the experiment tibia of 4 birds per replicate and ileal content collected to determine tibia-ash content and ileal P absorption, respectively. Results were analyzed by ANOVA using diet as treatment factor. At the highest dose level the new 6-phytase resulted in 5.6% higher (P < 0.01) BWG, 2.6% higher (not significant) tibia-ash content and 5.1% higher (P < 0.001) P retention compared with the E.coli-6-phytase. Exponential curve fitting showed that 390, 260, 195 FTU of the new 6-phytase was equal to 500 FTU E.coli-6-phytase based on BWG, tibia-ash and fecal P retention, respectively. It is concluded that based on standardized in vitro activity determined by the AOAC method and expressed as FTU/kg feed, the in vivo efficacy in young broilers between 6-phytases can be highly different.

Key Words: broilers, phytase, E. coli-6-phytase, P-retention, tibia-ash

47 Difference in in vivo efficacy of two 6-phytases in young turkeys. C. Kwakernaak*, J. D. Van der Klis†, and P. W. Plumstead‡, †Schothorst Feed Research, Lelystad, the Netherlands, ‡Danisco Animal Nutrition, Marlborough.

Phytases are supplemented to poultry diets to hydrolyze phytate, improve nutrient digestibility, decrease P excretion and decrease feed cost. Phytase is added to diets based on standardized phytase units (FTU) determined in vitro by the AOAC method. However, in vivo efficacy may differ between phytases. A new 6-phytase derived from Buttiauxella spp. and expressed in Trichoderma has been developed. The objective was to test if this new phytase has a different efficacy in vivo than a current commercial E. coli-6-phytase expressed in P. pastoris for young turkeys. Nine experimental diets were fed as pellets to BUT big 6 male turkeys housed in 6 replicate cages, 16 birds per cage from 5 to 21 d of age. A low P diet (negative control, NC) with 2700 kcal/kg AME _, (broiler), 284 g/kg CP, 5.6 g/kg P, 2.6 g/kg retainable P, 3.0 g/kg phytate-P, and 8.0 g/kg Ca was used. The phytase products and diets were analyzed for in vitro phytase activity according to the AOAC method by LUFA, Oldenburg, Germany. The new phytase was added at 350, 690, 1040 and 1380 FTU/kg on top of the NC diet. The E.coli-6-phytase was added at 390, 770, 1160 and 1540 FTU/kg. Feed and water were freely available. Performance was measured and at the end of the experiment tibia of 4 birds per replicate and ileal content collected to determine tibia-ash content and ileal P absorption, respectively. Results were analyzed by ANOVA using diet as treatment factor. At the highest dose level the new 6-phytase resulted in 4.9% higher (P < 0.001) BWG, 2.6% higher (not significant) tibia-ash content and 11.0% higher (P < 0.001) ileal P absorption compared with the E.coli-6-phytase. Exponential curve fitting showed that 275, 225, 180 FTU of the new phytase was equivalent to 500 FTU E.coli-6-phytase based on BWG, tibia-ash and ileal P absorption, respectively. It is concluded that based on standardized in vitro activity determined by the AOAC method and expressed as FTU/kg feed, the in vivo efficacy in young turkeys between 6-phytases can be highly different.

Key Words: turkeys, phytase, E. coli-6-phytase, P-retention, tibia-ash

48 Evaluation of a new generation phytase on phytate phosphorus release for growth and tibia strength in broilers fed a corn-SBM diet. E. Avila G.1, B. Fuente1, S. Charraga2, E. Rosales3, and S. R. Fernandez4, 1Universidad Nacional Autonoma de Mexico, Mexico City, Mexico, 2DSM Nutritional Products Mexico S.A. de C.V., El Salto, Jalisco, Mexico.

To test the effect of several inclusion levels of Citrobacter Braakii (CBP) phytase (RONOZYME HiPhos), on phytate P (PP) release, 432 7-d-old-Ross 308 male broilers were randomly allocated to 8 treatments with 9 replicates of 6 chicks each, divided in 3 blocks to get 3 replicates per block per treatment (blocking criteria; period on starter batteries). Chicks were housed in thermostatically controlled starter batteries with...
raised wired floor. Feed and water were provided ad libitum. The birds were fed a corn-SBM pre-starter diet from d 1 to 6 formulated to fulfill all nutrient requirements for Ross 308 males. On d 7 the broilers were assigned to the following treatments; 1 a basal corn-SBM diet deficient in available phosphorus (Av P); 0.15%. Treatments 2 to 4 were added with constant increases of 0.075% inorganic P to get a linear broiler growth response to P addition. Treatments 5 to 8 were the addition of 500, 1,000, 2,000 and 3,000 phytase units (FYT)/kg to the basal diet. Data was analyzed as RCBD. Variables analyzed were: weight gain (WG), tibia strength (TS), tibia Ca (TC), tibia P (TP) and tibia ash (TA). The results from treatments 1 to 4 were analyzed by a regression model to test for a significant linear response (P < 0.05). Then for every level of CBP added (treatments 5 to 8) the linear regression equation was solved to find out the equivalent value of released P. Following the significant (P < 0.05) linear response equations for WG, g/chicken (Y = 925X + 453 R² = 0.91), TS, kg/cm² (Y = 71.5X + 10.45 R² = 0.90), TC, % (Y = 17.1X + 14.0 R² = 0.85), TP, % (Y = 9.7X + 6.6 R² = 0.88) and TA (Y = 41.3X + 37.7 R² = 0.90). Under the experimental conditions of the present trial, the average P release values per level of CBP inclusion in the corn-SBM diet were; 500 FYT/kg = 0.100%, 1,000 FYT/kg = 0.153%, 2,000 FYT/kg = 0.188%, and 3,000 FYT/kg = 0.219%.

Key Words: Citrobacter Braakii, broilers, phytase, available, phosphorus


Phytase is an enzyme capable of degrading phytate, which is a significant anti-nutrient that negatively influences mineral and amino acid digestibility, endogenous enzyme and mucin secretion, and growth. An experiment was conducted to evaluate the influence of a novel microbial phytase on broiler performance from d 0 to 42 and tibia ash at d 21. Male Cobb 500 broilers (n = 2,016) were fed one of 7 experimental diets: positive control (PC) corn-soy diet formulated to meet all NRC requirements, a negative control diet (NC) reduced in Ca and P by 0.15 and 0.23% in the starter (0–21d) and 0.15 and 0.15% in the finisher (22–35d), respectively. The NC was supplemented with 0, 500 or 2,500 FTU/kg feed of an evolved E. coli phytase. Feed and water were offered ad libitum and monitored using load cells which reported data every 5 min. As expected the NC reduced (P < 0.05) gain and intake compared with the PC at both 21 and 35d of age, with no differences (P > 0.05) in FCR. Addition of 500 FTU/kg of phytase increased (P < 0.05) gain at 21 and 35d, with the higher dose improving gain further at 21 (P < 0.05) and 35d of age (NS) such that it was equal to the PC. The water:feed ratio of birds fed the PC was approx 4:1 at 1d and fell very slowly to less than 2:1 at 35d. Birds offered the NC exhibited a 3.5:1 ratio at 1d, which then rose to a maximum of 4:1 at 3.5d, before gradually declining to 2:1 at 35d. Beyond 2d, the water:feed ratio of the NC was always 0.5 greater than that of the PC. Addition of phytase resulted in the water:feed ratio dropping in a dose dependent manner to that more consistent with the PC. These data suggest that it is not phytase per se but the dietary changes enacted on its behalf which increased the water:feed ratio and ultimately increases the risk of wet litter. The effect is noticeable almost immediately, but the consequence is not observed until the birds are older and fecal output is significant. Ironically phytase supplementation actually reduced water:feed ratio in a dose dependent manner thus reducing the likelihood of wet litter.

Key Words: phytase, water, wet litter, water:feed ratio

50 Is phytase responsible for increasing the water:feed intake ratio? M. R. Bedford, C. L. Walk, and I. Kühn, AB Vista Feed Ingredients, Marlborough, Wiltshire, UK.

Anecdotal evidence suggests that the use of phytase is sometimes associated with wet litter. In such cases, removal of the phytase and reversion to the original diet has often resolved this issue, providing apparent proof of the association. This trial was designed to test the influence of phytase on the water:feed ratio in male Ross 308 broilers. Birds were randomly allocated, 15 per pen to one of 4 treatments; a positive control (PC) corn-soy diet formulated to meet all NRC requirements, a negative control diet (NC) reduced in Ca and P by 0.15 and 0.23% in the starter (0–21d) and 0.15 and 0.15% in the finisher (22–35d), respectively. The NC was supplemented with 0, 500 or 2,500 FTU/kg feed of an evolved E. coli phytase. Feed and water were offered ad libitum and measured using load cells which reported data every 5 min. As expected the NC reduced (P < 0.05) gain and intake compared with the PC at both 21 and 35d of age, with no differences (P > 0.05) in FCR. Addition of 500 FTU/kg of phytase increased (P < 0.05) gain at 21 and 35d, with the higher dose improving gain further at 21 (P < 0.05) and 35d of age (NS) such that it was equal to the PC. The water:feed ratio of birds fed the PC was approx 4:1 at 1d and fell very slowly to less than 2:1 at 35d. Birds offered the NC exhibited a 3.5:1 ratio at 1d, which then rose to a maximum of 4:1 at 3.5d, before gradually declining to 2:1 at 35d. Beyond 2d, the water:feed ratio of the NC was always 0.5 greater than that of the PC. Addition of phytase resulted in the water:feed ratio dropping in a dose dependent manner to that more consistent with the PC. These data suggest that it is not phytase per se but the dietary changes enacted on its behalf which increased the water:feed ratio and ultimately increases the risk of wet litter. The effect is noticeable almost immediately, but the consequence is not observed until the birds are older and fecal output is significant. Ironically phytase supplementation actually reduced water:feed ratio in a dose dependent manner thus reducing the likelihood of wet litter.

Key Words: phytase, water, wet litter, water:feed ratio

51 Evaluation of commercial phytases fed in low phosphorus broiler diets. C. Wyatt a, T. York b, T. Santos c, and S. Davis b, AB Vista Feed Ingredients, Chesterfield, MO, Colorado Quality Research, Wellington, CO.

Using a phosphorus (P) bio-available assay, 4 commercial phytases were evaluated in 18 d old broilers to determine P bio-equivalency. A total of 2400 d old broilers were divided into 12 treatments with 10 replicates per treatment and 20 birds per replicate. The experimental design consisted of 4 available phosphorus (Av P) levels ranging from sufficient (0.45%) to deficient (0.18%) with 4 commercial phytases added to the deficient diet in either liquid or dry form. Calcium was held constant in all diets. The 4 commercial phytases compared were a new enhanced E. coli phytase (Quantum Blue), an enhanced E. coli phytase (Quantum TR), a wild-type E. coli phytase or a fungal phytase. All phytases were added at commercial doses targeting either 500 or 1850 IU/kg depending on source. The liquid form was applied post-pellet. At d 18, feed intake (FI), body weight gain (BWG) and livability were

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recorded. Also, 3 birds/ replicate were randomly selected and the left tibia collected and processed to determine bone ash levels. Phosphorus bio-equivalency values were determined for each phytase source using logarithmic regressions for FI, BWG, tibia weight and tibia ash %. All phytase sources significantly enhanced performance ($P > 0.05$) when compared with the 0.18% AvP diet. Phytase when added in liquid form, regardless of source, resulted in better performance compared with the dry form. Although animal performance was severely impacted by the low AvP diet, the new non-coated enhanced E. coli phytase resulted in significant improvements ($P > 0.05$) in animal performance (BWG, Tibia Ash %) compared with all other phytases tested. In addition, feeding 500 FTU/kg of the new enhanced E. Coli phytase resulted in the highest available phosphorus release in both dry or liquid form (P release equivalent to 0.184%), supporting the best performance data overall. This study demonstrates the importance of feeding a deficient phosphorus diet to differentiate commercial phytases being introduced in today’s market.

**Key Words:** enhanced E. coli phytase, P bio-assay, broiler, available phosphorus, tibia ash

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**52  Xylanase use in rearing phase diets of broiler breeders and subsequent effects on egg production.**  
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Uniformity and adherence to target weights for broiler breeders during the rearing phase are key factors for successful egg production. The aim of this study was to evaluate, under commercial conditions, the use of xylanase (Econase XT 25, AB Vista) in rearing phase diets of broiler breeders and the effects on flock uniformity and egg production. Both body weight and muscle conformation are important during the rearing phase. At 1, 4 and 8 weeks of age birds were individually weighted and divided into 4 categories according to their weight (heavy, standard, light, and extremely light birds). From the 9th until the 20th week birds were kept in the same category of weight as in 8th week and received feed targeted to the standard genetic weight for that age. Birds were then moved to production barns and the production phase ran from 24 until 66 weeks of age. Seventy 7 thousand female day-old Cobb 500 broiler breeders were randomly allotted into 2 different treatments: xylanase (XY - 16,000BXU/Kg; 30Kcal/Kg) and control diets (CT). Birds received xylanase from day of age until wk 23, and from the 24th until the 66th week all birds received the same control diet. Data were subjected to ANOVA, and when statistically differences were found, means were separated using Tukey’s test ($P < 0.05$). No differences were found in feed consumption and mortality during the trial. Xylanase resulted in more birds in the heavy group (17.0 vs. 13.5%) and less birds in the light group (13.6 vs. 15.5%) when compared with CT during the first 8 weeks of rearing. At the end of rearing phase, the variation in weight of the XY was between 96 and 110% while CT birds were between 96 and 120% of the standard for 20 weeks. Throughout the whole egg production phase, weekly production of eggs was 0.8% higher ($P = 0.02$) and there were 0.1 more eggs/housed hen/week ($P < 0.01$) in the XY compared with the CT. In conclusion, birds receiving xylanase during the rearing period showed better uniformity and distribution among the different weight categories resulting in better egg production.

**Key Words:** uniformity, xylanase, egg production