### Nutrition V

145  **Effects of Original XPC on performance of layers.** K. E. Anderson¹ and J. Frank². ¹North Carolina State University, Raleigh, ²Diamond V, Cedar Rapids, IA.

Laying hens (11 white and 7 brown strains; approximately 17 weeks of age; n = 9594) were utilized in a 16 week study to determine the effect of Saccharomyces cerevisiae fermentation product (Original XPC) on hen day and hen housed production, egg weight, size, and quality, and feed conversion. Hens were housed at 2 densities (497 or 471 cm² with 5 or 7 hens/cage) within 2 production houses (approximately 13 replicates per strain x density combination). Treatments were: Control and XPC (0.68 kg/ton feed). Egg weights and sizes were recorded from the previous 24 h production for every 28 d period starting at 119 d of age. Percentages of eggs within each size category, average egg weight, and average egg mass were calculated. Egg shell strength was determined from a subset sample of eggs (6 eggs from 3 replicates per strain per density during each period) using a Texture Technologies TA-XT2i texture analyzer. Breaking force was defined as the force in grams required to fracture the shell. Egg quality was determined using USDA grades. Feed was provided ad libitum and was weighed back every 28 d by replicate group. Feed intake, feed cost, feed/dozen eggs, and feed per unit of egg mass were calculated. Data was analyzed separately for white and brown strains using PROC GLM of SAS. LS Means that were significant were separated using PDIFF. For white and brown strains, hen day and hen house production, feed per bird per day, and percentage of extra large eggs was greater (P < 0.05) for hens supplemented with XPC. Percentage of leakers and medium size eggs were lower (P < 0.05) for hens supplemented with XPC. White strains of hens supplemented with XPC had greater (P < 0.05) percentage of grade A eggs and egg albumen concentrations, and lower (P < 0.05) percentage of checks. Brown strains of hens had greater (P < 0.05) shell strength and elasticity. The results indicate that supplementation of XPC can improve egg production and egg quality in white and brown strains of laying hens.

**Key Words:** layers, Saccharomyces cerevisiae fermentation product, egg production, egg quality, feed conversion

146  **Bacillus subtilis** (GalliPro Max) significantly improves production parameters in laying hens. V. Ribeiro¹, L. F. T. Albino¹, I. Knap², A. B. Kehlet², H. S. Rostagno¹, Universidade Federal de Viçosa, Viçosa, Brazil, ¹Chr. Hansen A/S, Hoersholm, Denmark.

A trial was conducted with the objective to evaluate the effect of a direct fed microbial addition (Bacillus subtilis DSM 17229, GalliPro Max) to layer diets on the hen performance from 25 to 45 weeks of age. The parameters evaluated were egg production (EP), egg weight (EW), egg mass (EM), feed intake and feed conversion per g of egg mass (FCE). A total of 180 Hy-Line layers (25-week-old) were housed in cages (25 x 40 cm) 2 hens per cage, with a total floor space of 1000 cm². The birds were fed diets formulated to contain corn, soybean meal with adequate nutrient levels, following the recommendations of the Brazilian Tables. The 3 dietary treatments were 0 (Control), 4E5 or 8E5 cfu of *B. subtilis* per gram of feed. A randomized block experimental design, with 3 treatments, 10 replicates with 6 hens each was used. The experiment lasted 5 periods of 28 d. When compared with the control treatment, egg production was significantly improved by 2.6% (from 89.45 to 91.80%), egg weight by 1.4% (from 59.97 to 60.84 g) and egg mass by 3.7% (53.68 to 55.72 g/day) when *B. subtilis* DSM 17229 was added to the diet by 8E5 cfu/g feed. In addition feed conversion per gram of egg was improved by 3.5 points (from 1.778 to 1.735 g/g) when *B. subtilis* DSM 17229 was added in a concentration of 4E5 cfu/g feed. In this experiment, it can be concluded that *B. subtilis* DSM 17229 significantly improves production parameters and feed conversion in layers when added to a standard diet. Depending on customer requirements *B. subtilis* DSM 17229 at 8E5 cfu/g feed can be recommended for high egg production while *B. subtilis* DSM 17229 4E5 cfu/g can be recommended as the most economic choice.

**Key Words:** Bacillus subtilis, direct fed microbial, laying hens, egg production, feed utilization

147  **Yeast derivatives as dietary supplements for broiler chickens:** Effect on performance and intestinal microrolla enumeration of broilers exposed to *Salmonella pullorum*. S. Haldar¹, C. L. Walk², and M. R. Bedford². ¹West Bengal University of Animal and Fishery Sciences, Kolkata, India, ²AB Vista Feed Ingredients, Marlborough, Wiltshire, United Kingdom.

Six-hundred, day-old, male broiler chicks were randomly assigned to 6 dietary treatments of 8 replicate pens of 12 birds/pen. Dietary treatments were a control (C) formulated according to Ross nutrient requirements, C plus 0.4 g/kg bacitracin methylene disalicylate (BMD), C plus 0.1 g/kg yeast A, B, C, or D. Feed and pen weights were recorded weekly and BW gain (BWG) and FCR were calculated. On d 25, intestinal samples were obtained from the duodenum, jejunum, and ileum from 8 birds/dietary treatment were segregated into floor pens and orally gavaged with *Salmonella pullorum*. Seven days post-inoculation, the birds were killed and intestinal samples were obtained for microflora counts as reported earlier. Yeast C and D improved (P < 0.05) BWG and FCR compared with the NC. There were no other dietary treatment associated differences in BWG or FCR. At d 25, yeast supplementation or BMD generally increased (P < 0.05) the number of *E. coli* and *Salmonella* spp. cfu along the small intestinal wall and decreased (P < 0.05) the number of *E. coli* and *Salmonella* spp. cfu in the lumen compared with the NC. In general, Lactobacillus spp. were not affected (P > 0.05) by dietary treatments. After oral inoculation with *S. pullorum*, *E. coli* cfu were increased (P < 0.05) along the small intestinal wall of broilers fed yeast D and reduced (P < 0.05) in the intestinal lumen of broilers fed yeast B and D compared with all other diets. *Salmonella* spp. cfu were reduced (P < 0.05) along the intestinal wall of broilers fed yeast B compared with the NC, yeast C, or yeast D and increased (P < 0.05) in the lumen of broilers fed yeast D and BMD compared with yeast A. The results indicate that oral inoculation with *S. pullorum* altered the microflora of the gastrointestinal tract and *E. coli* and *Salmonella* spp. present in the luminal compartment of the gut were more sensitive to yeast supplementation compared with those attached to the mucosal surface.

**Key Words:** broiler, yeast, gut microflora

148  **New Bacillus subtilis (GalliPro Max) significantly improves broiler production both in combination with antibiotic growth promoter (AGP) and without AGP.** I. Knap and A. B. Kehlet, Chr. Hansen A/S, Hoersholm, Denmark.

*Bacillus* spores are ideal as DFM due to termostability and consistent performance. As the spores enter the small intestine, they start germinating. The vegetative *Bacillus* cells grow and multiply in the intestine. The probiotic effect of *Bacillus* is due to its immune stimulation, production of metabolites and pathogen exclusion. A new strategy has been invented to select for *Bacillus* spores with fast outgrowth at
a high bile salt level and at the same time with increased production of metabolites. The first product developed based on this technology is GalliPro Max. Several trials have been conducted both in combination with bacitracin methylene disalicylate (BMD) and without BMD. The new *Bacillus subtilis* (NBS) gave a significantly effect in a trial with a US commercial corn-soybean meal based diets on top of 55 ppm BMD. (1080 male Cobb x Cobb broilers, 3 diets for 42 d with 8 replicates and 45 birds per experimental unit) Diet 1) control, Diet 2) BMD added at a level of 55 ppm, Diet 3) NBS added at a level of 8E5 cfu/g feed + BMD at 55 ppm. FCR at d 42 was significantly (*P < 0.05*) improved by 7 FCR points (1.720) using NBS + BMD compared with only BMD (1.790). In a Brazilian trial the NBS gave a significantly effect with a Brazilian commercial corn-soybean meal based diets compared with BMD (254 male birds commercial strain (Cobb), 3 diets for 42 d with 8 replicates and 21 birds per experimental unit) Diet 1) control, Diet 2) BMD added at a level of 55 ppm, Diet 3) NBS added at a level of 8E5 cfu/g feed. FCR at d 42 was significantly (*P < 0.05*) improved by 3 FCR points using NBS (1.705) compared with only BMD (1.734). In conclusion, these results showed that the new *Bacillus subtilis* (GalliPro Max) significantly improved production parameters when added to a commercial grade diet containing an antibiotic growth promoter and also significantly improved production parameters compared with an antibiotic growth promoter.

**Key Words:** *Bacillus subtilis*, BMD, broiler, feed utilization, direct-fed microbial


A trial was conducted to determine the effect of a heat stable protease (Cibenza DP100) on the growth performance and carcass yield of commercial tom turkeys. Seven hundred Nicholas 700 strain pouls were reared to 5 wk on a common diet with or w/out enzyme (2 lb/ton). Pouls were reared from 5 to 20 wk on high (HP) or low protein (LP) diets with or w/out enzyme (12 enzymes per treatment, 14 birds per pen). Performance (BW and feed conversion, FC) was determined at 5, 10, 15 and 20 wk. Carcass yield was determined at 20 wk on 60 birds per treatment from the 5 pens with mean BW closest to the treatment means. Data were analyzed using GLM of SAS for a 2x2 factorial design (*P < 0.05*). The enzyme supplemented in the diet improved BW at each age. The LP reduced BW at 5 and 10 wk but not 15 or 20 wk. The FC was not different between treatments at 5, 15, or 20 wk. At 10 wk, birds fed HP with enzyme had significantly lower FC than birds fed LP. There were no treatment effects on carcass yield. Cibenza DP100 improves the growth performance of commercial turkey toms.

**Key Words:** turkey, enzyme, protease, growth, feed conversion

**150 CIBENZA DP100 protease improves broiler performance with reduced amino acid density diets.** O. Gutierrez* and R. E. Buresh. _Novus International, St. Charles, MO._

Two trials were conducted to determine the effect of feeding Cibenza DP100 on broiler performance and processing characteristics. Both trials were conducted at a commercial research facility in floor pens. In Trial 1, male Cobb broilers were grown to 42 d of age in pens containing 45 broilers per pen and there were 8 replicates of each treatment. In Trial 2, there were 10 replicates of pens containing 20 male broilers per pen. The 3 treatments were (1) Control, (2) Negative Control (amino acids reduced to equal recommended amino acid credit from DP100), and (3) Negative Control + DP100 at the rate of 1.0 pound per ton of feed. The DP100 inclusion was formulated using the recommended amino acid values which account for a reduction of amino acids in the diets of approximately 7.5%. All diets were corn and soybean meal based containing 2.5% DDGS and 2.5–3.75% of a commercial animal protein blend. All diets also contained a phytase and a β-mannanase, each at the recommended levels. Body weight, feed consumption and mortality were measured at 19, 35 and 42 d of age. Weight gain and adjusted feed conversion were calculated. Samples of the birds in the second trial were processed for yield evaluation. There were no significant differences between any of the treatments for 42 d body weights in both trials. In Trial 1, adjusted feed conversion was significantly poorer for the Negative Control (*P = 0.065*), but there was no difference between the Positive Control and the DP100 treatment. In Trial 2, the adjusted feed conversion differences showed similar trends but were significant at *P < 0.05*. The processing results from Trial 2 indicated no significant differences between treatments for the primary parameters of carcass yield, breast meat yield and carcass fat. These data demonstrate that Cibenza DP100 can be incorporated into broiler diets at the recommended matrix values and maintain broiler performance and yield parameters.

**Key Words:** protease, broiler, performance, processing parameters

**151 Evaluation of protease supplementation on corn-SBM broiler diets reduced in crude protein and amino acids.** M. Hidalgo* and H. Hidalgo, Universidad de Chile, Chile.

An experiment was conducted to evaluate the effect of a commercial protease (Cibenza DP-100) fed to broilers from 5 to 20 d of age. Straight run Ross 308 chicks (150) were placed across 25 pens of grow-out battery (6 birds/pen, 5 reps/trt). All birds were fed a corn-soybean meal diet (23% PC, 3.025 kcal/kg) adequate in all nutrients for the first 4 d. Experimental diets were fed from 5 to 10 d of age for the starter diets and 11 to 20 d for the grower diet. For each experimental period the 5 dietary treatments used were as follows. A positive control (PC) formulated to Ross 308 recommendations. A negative 1 diet (N1) was achieved by 7.5% reduction in total protein and amino acids levels from the PC. A protease 1 (P1) diet was designed using N1 specifications with the enzyme formulated using a matrix of 7.5% for crude protein and amino acids. A negative 2 (N2) diet was achieved by 5% reduction in total protein and amino acids levels from the PC. A protease 2 (P2) diet was designed using N2 specifications with enzyme formulated using a matrix of 5% for crude protein and amino acids. Body weight F:G and feed consumption were determined at 11 and 21 d of age. Data were analyzed by ANOVA. Body weight F:G and feed consumption were determined at 11 and 21 d of age. Data were analyzed by ANOVA. Body weight F:G and feed consumption were determined at 11 and 21 d of age. Data were analyzed by ANOVA. Body weight F:G and feed consumption were determined at 11 and 21 d of age. Data were analyzed by ANOVA. Body weight F:G and feed consumption were determined at 11 and 21 d of age. Data were analyzed by ANOVA. Body weight F:G and feed consumption were determined at 11 and 21 d of age. Data were analyzed by ANOVA. Body weight F:G and feed consumption were determined at 11 and 21 d of age. Data were analyzed by ANOVA. Body weight F:G and feed consumption were determined at 11 and 21 d of age. Data were analyzed by ANOVA. 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An experiment was conducted to evaluate the effect of a protease (RONOZYME ProAct) on broiler diets from 1 to 48d of age. A total of 240 d-old male Cobb 500 broiler chicks were randomly allocated across 28 floor pens (15 birds/pen, 7 reps/trt). The experiment consisted of a 2x2 factorial arrangement including 2 protein levels (standard and low) and 2 enzyme levels (0 and 200 ppm). All birds were fed a pelleted corn-soybean meal diet. Pelleting temperature was 80°C and retention time was approximately 30sec. Body weight (BW) feed intake (FI) and feed conversion ratio was corrected by mortality (FCR) and was recorded weekly. Standard protein level was according to typical Argentinian poultry industry diets (23.6%, 20.7%, 19.1% and 18.1% for starter, growing, finisher and last week, respectively); low protein diets was formulated with 6% less crude protein and amino acids (lysine, methionine and threonine) than standard diets. No differences were found due to diets or enzyme inclusion in FI, except at 7d where a larger feed intake in low protein (LP) compared with standard diet (SD) was observed. Chickens from SD were heavier than ones from LP diet (P ≤ 0.05 at 21, 28 and 48d). Chickens fed with protease were heavier than ones without enzyme. This difference (1.9%) was significant at 48d despite of the dietary protein level. An interaction diet by enzyme was observed at 14, 35 and 42d; in these cases, differences were significant (P ≤ 0.05) only when protease was added to LP diet. There was no interaction between diets and enzyme levels in FCR. Birds fed SD had better FCR than birds fed LP diet, significant differences were found at 7, 14, 35, 42 and 48 d. Protease always improved FCR (between 1.0 and 1.9%) and these differences were significant (P ≤ 0.05) at 7, 14, 35 and 48d. In conclusion, 6% reduction in protein, lysine, methionine and threonine negatively affects the broiler performance compared with the standard diet. The inclusion of protease improves BW and FCR both in LP and standard diets and was able to overcome the performance losses by the 6% reduction in protein and amino acids.

Key Words: amino acid, enzyme, protease, protein

153 A comparative examination of the effect of β-mannanase (Hemicell) on broiler chicken performance to 42 days provided with corn-soybean meal diets at varying levels of soybean meal. M E Jackson1, H Y Hysla1, D M Anderson1, and G W Mathis2,1ChemGen Corp, Gaithersburg, MD, 2Southern Poultry Research, Athens, GA.

β-mannan is a polysaccharide found in soybean meal and other plant proteins. β-mannan is known to have powerful negative effects on animal health and performance by creating wasteful stimulatory effects on the innate immune system. It also has been shown to negatively interfere with insulin secretion and glucose metabolism. A large proportion of β-mannan in broiler diets originates from soybean meal. The proposed trial is intended to determine the degree to which beneficial effects of β-mannanase (Hemicell) are influenced by soybean meal on male broiler performance when formulated into practical rations. A 42-d pen trial was conducted in floor pens with 50 male Cobb x Cobb birds per pen, 4 diets, and 8 replications. Individual body weights were determined at 42 d of age. Dietary treatments were: (1) Low soybean meal control; (2) as (1) plus β-mannanase; (3) High soybean meal control; (4) as (3) plus β-mannanase. The control diets were formulated with similar, practical nutrient and ingredient inclusions, particularly in the starter phase. In addition, the inclusion rate of Ca, Lys:ME, and the presence or absence of antibiotics in overall dietary phases also significantly (P ≤ 0.05) affected the response to Econase XT of broiler FCR. For example, in the current model, Ca and Na, energy, phosphate, and total added fat and the presence or absence of antibiotics in the starter phase. In addition, the inclusion rate of Ca, Lys:ME, and the presence or absence of antibiotics in overall dietary phases also significantly (P ≤ 0.05) affected the response to Econase XT of broiler FCR. Factors significantly (P ≤ 0.05; R2 = 0.42) affecting the FCR response included log dose of Econase XT, inclusion rate of Ca, Na, energy, phosphate, corn, and total added fat and the presence or absence of antibiotics in the starter phase. A large proportion of β-mannan in broiler diets originates from soybean meal. The proposed trial is intended to determine the degree to which beneficial effects of β-mannanase (Hemicell) are influenced by soybean meal on male broiler performance when formulated into practical rations. A 42-d pen trial was conducted in floor pens with 50 male Cobb x Cobb birds per pen, 4 diets, and 8 replications. Individual body weights were determined at 42 d of age. Dietary treatments were: (1) Low soybean meal control; (2) as (1) plus β-mannanase; (3) High soybean meal control; (4) as (3) plus β-mannanase. The control diets were formulated with similar, practical nutrient and ingredient inclusions, particularly in the starter phase. In addition, the inclusion rate of Ca, Lys:ME, and the presence or absence of antibiotics in overall dietary phases also significantly (P ≤ 0.05) affected the response to Econase XT of broiler FCR. For example, in the current model, Ca and Na, energy, phosphate, and total added fat and the presence or absence of antibiotics in the starter phase. In addition, the inclusion rate of Ca, Lys:ME, and the presence or absence of antibiotics in overall dietary phases also significantly (P ≤ 0.05) affected the response to Econase XT of broiler FCR. Factors significantly (P ≤ 0.05; R2 = 0.42) affecting the FCR response included log dose of Econase XT, inclusion rate of Ca, Na, energy, phosphate, corn, and total added fat and the presence or absence of antibiotics in the starter phase. In conclusion, 6% reduction in protein, lysine, methionine and threonine negatively affects the broiler performance compared with the standard diet. The inclusion of protease improves BW and FCR both in LP and standard diets and was able to overcome the performance losses by the 6% reduction in protein and amino acids.

Key Words: amino acid, enzyme, protease, protein

155 A comparison of xylanase, amylase and protease effects on AME and amino acid digestibility in broilers fed corn/soy-based diets with or without DDGS and canola. P. W. Plumstead1, L. F. Romero1, and V. Ravindran*1. 1AB Vista Feed Ingredients, Marlborough, Wiltshire, United Kingdom. A series of experiments was conducted investigating the efficacy of Econase XT, a xylanase derived from Trichoderma reesei, in improving the FCR of broilers fed diets predominantly based on corn. One hundred and thirty data points representing the starter and average of all dietary phases were entered into a holo-analysis. Data were analyzed using step-wise regression in JMP Statistical Software version 8.0 to determine the statistical effects of various dietary factors, enzyme dosages and management practices on the FCR response to Econase XT. Factors significantly (P ≤ 0.05; R2 = 0.42) affecting the FCR response included log dose of Econase XT, inclusion rate of Ca, Na, energy, phosphate, corn, and total added fat and the presence or absence of antibiotics in the starter phase. In addition, the inclusion rate of Ca, Lys:ME, and the presence or absence of antibiotics in overall dietary phases also significantly (P ≤ 0.05) affected the response to Econase XT of broiler FCR. For example, in the current model, Ca and Na in the starter phase are negatively and positively correlated, respectively (P = 0.0131; P < 0.0001) with the effect of Econase XT on FCR. These data suggest dietary Ca in the starter phase may improve the FCR response associated with feeding Econase XT. In contrast, the inclusion of dietary Na above 20% may negatively influence the effect of Econase XT on broiler FCR. These data suggest nutrient and ingredient inclusions, particularly in the starter phase, may have a significant effect on Econase XT efficacy in broilers.

Key Words: broiler, xylanase, holo-analysis, FCR
respective AMEn improvement of 67 and 77 kcal/kg feed provided by AZ1502 addition to CS or mixed diets was not significantly ($P > 0.05$) different to full dose XAP. Average AA digestibility of 85.3% for 16 AA in corn soy diets was higher vs. that in mixed diets (81.7%). Both XAP and AZ1502 increased ($P < 0.05$) AA digestibility in a similar manner, resulting in an increase in average AA digestibility of 2.55% in CS diets and 5.13% in mixed diets. Although effects of XAP enzymes on AMEn were similar for CS and mixed diets, they have the potential to provide a greater increment in AA digestibility when diets contained DDGS and canola meal.

Key Words: broiler, AME, amino acid digestibility, enzymes

156 Performance effects of an amylase, xylanase and protease combination in broilers fed corn-soy based diets and mixed grain diets


A 42 d performance trial was conducted to evaluate responses to dietary supplementation of an enzyme complex containing xylanase, amylase from Bacillus licheniformis, and a subtilisin protease (XAP; $X = 2,000$ U, $A = 200$ U, $P = 4,000$ U/kg feed; Danisco Animal Nutrition). Diets were based on either corn, corn-DDGS (5%) and soybean meal; or corn, wheat, wheat DDGS and soybean meal. For each diet type a positive control (PC) and a negative control (NC) were formulated. The NC was reduced by 85 kcal ME/kg and 2.5% amino acids, XAP was added to the NC diet. Diets were fed as mash. Birds were housed in floor pens with 15 birds/pen and 8 pens per treatment. Weight gain, feed intake and FCR were monitored during the trial. Faeces were collected d 42 of the trial for AMEn determination. Data were analyzed by ANOVA.

Significant differences were assessed at $P < 0.05$. Down specification, as compared with Ross specifications. Each trial consisted of 2 dietary treatments (control and XAP) with 6 replicates per treatment. Ileal energy and protein digestibility were determined both at 11 and 21 d, whereas starch and fat digestibility were measured only at 21 d to assess their relative contributions to digestible energy. Data were analyzed by ANOVA and significant differences were assessed at $P < 0.05$ unless otherwise stated. XAP increased BW gain from 3,159 to 3,286 g/bird ($P < 0.01$) and reduced FCR from 1.638 to 1.596 g/g ($P = 0.06$) compared with the control treatment. XAP increased ileal digestible energy from 3,088 to 3,267 kcal/kg DM at 11 d (+179 kcal/kg DM), and from 3,191 to 3,265 kcal/kg DM at 21 d (+74 kcal/kg DM) with an average increment in ileal digestible energy of 127 kcal/kg DM ($P < 0.001$). XAP increased ileal starch digestibility from 92.7 to 97.5% ($P < 0.001$), and fat digestibility from 86.2 to 89.9% ($P < 0.01$) versus the control diet. Increments in ileal digestible starch (+14.2 g/kg; $P < 0.05$), fat (+2.3 g/kg; $P < 0.05$), and protein (+1.9 g/kg; $P > 0.05$) accounted for 59.7 kcal/kg, 21.5 kcal/kg and 10.6 kcal/kg, respectively, of the energy digestibility effects of XAP compared with the control diet; therefore, a total of 91.8 kcal/kg was explained by the improvement in the digestibility of these substrates at 21 d. The increment of energy digestibility of XAP on top of phytase (100%) was explained, in order of magnitude, by increments in the apparent ileal digestibility of starch (65%), fat (23%), and protein (12%).

Key Words: amylase, broiler, protease, xylanase

158 Response of broiler strains to nutritionally adequate corn-soybean vs corn-soybean-meat-feather feeds and to ones given multiple supplemental enzymes with adjustment for ME and P

E. T. Moran*1 and E. E. M. Pierson2, 1Auburn University, Auburn, AL, 2Danisco Animal Nutrition, St Louis, MO.

Differences exist among broiler strains in their live performance and carcass composition and affect their nutritional need. Response of different strains (A and B) to changes in feed formulation and inclusion of additives that alter nutrient availability were compared. Breeder flocks (A-37 wk; B-34 wk) from separate commercial sources provided eggs that were hatched at Auburn University. Chicks were feather-sexed and spray vaccinated for coccidiosis (Coccivac-D; Schering-Plough) then 15 males placed in each of 64 used litter pens, respective of strain, and without limitation to feed, water and light. Feeds (pelleted) were formulated either completely on corn and soybean meal or maximally included meat meal (5%) and feather meal (2%) based on actual feedstuff commercially accepted values for nutritional requirements when greater than NRC (1994). Corresponding feeds supplemented with Avizyme1502 and Phyzyme XPT (Danisco) which together provided (per kg diet) xylanase (300 u/kg), a-amylase (400 u/kg), protease (4000 u/kg), and phytase (500 FTU/kg) had feedstuff adjustments resulting in a loss of 100 kcal/kg and 0.10% available P. Body weight gains 0–8 weeks of age were similar for all treatments (4514 g). A significantly greater F/G occurred for strain A than B (1.96 vs 1.87) and was the only difference in live performance. Carcasses from A had additional abdominal fat (2.13% vs 1.67%) which led to reduced chilled yield upon its removal compared with B (71.0% vs 72.1%). Fillets, tenders and skinless boneless thigh meat, as well as femur strength were also in lesser quantities with A than B. The only differential response among treatments involved a failure of fillets with A to increase to the same extent as B using enzymes. Although many other differences existed between A and B, the relative advantage of supplemental enzymes to feeds having
Reduced ME and AP were all consistent in response, regardless of meat and feathermeal usage.

Key Words: broiler strains, enzyme supplements, feather meal, meat meal

Effect of whole sorghum, a phytase and diet formulation on the energy value of low-density diets for finishing broilers. S. Gómez*1,2, M. L. Angeles1, E. Ramírez1,2, and S. Fernández3, 1INIFAP, Ajuchitlan, Queretaro, Mexico, 2FESC-UNAM, Ajuchitlan, Queretaro, Mexico, 3DSM Nutritional Products Mexico SA de CV, El Salto, Jalisco, Mexico.

An experiment was carried out to evaluate the growth performance, nutrient retention and the apparent metabolizable energy corrected to zero nitrogen retention (AMEn) of low-density diets added with whole sorghum (WS) and a phytase (PHY) in broilers from 28 to 42 d of age. Seventy Ross B308 male broilers, individually fed, were assigned to 7 dietary treatments: A Positive control (PC) sorghum-soybean meal diet (SSBM) with nutrient content according to Ross recommendations, and 6 treatments in a factorial arrangement of 2 negative control (NC) low-density diets (NC1 = SSBM and NC2 = SSBM plus canola meal and dry distillers grain with solubles; the ME, Ca and Avail. P content were reduced by 200 kcal/kg, 0.1% and 0.1%, respectively, in both NC diets compared with the PC) and 3 formulations (GS = all ground sorghum; WS = 20% WS replaced 20% GS; and WS+PHY = 20% WS + 150 g of Ronozyme-P (CT)/ton of feed as source of PHY). No statistical differences were observed between the PC and the rest of the treatments for any of the response variables. The weight gain of broilers was greater \( (P < 0.10) \) on the NC2 compared with the NC1 diet. Regardless of diet, the feed conversion ratio \( (P < 0.05) \) and the dry matter and energy retention \( (P < 0.10) \) were greater for WS+PHY compared with GS and WS formulations. Also, the AMEn (kcal/kg of feed) was higher \( (P < 0.05) \) for WS+PHY (2967) compared with GS (2824) and WS (2875) formulations. The AMEn for the PC diet was 2972 kcal/kg of feed. In summary, the combination of 20% WS plus PHY added to low-density diets improved the feed conversion ratio and the energy value of feed compared with diets formulated with GS or 20% WS. The growth and the energy use were comparable between broilers fed low-density diets added with 20% whole sorghum plus a phytase versus broilers fed a normal nutrient control diet.

Key Words: whole sorghum, phytase, nutrient retention, AMEn, broiler chickens