198  Effect of xylanase+β-glucanase on the performance and digestibility of broilers fed corn/soybean meal based diet. Danielle C. Z. Donato¹, Luciana G. Franco¹, Maurício S. Cunha¹, Ana Paula A. Oliveira¹, Nilva K. Sakomura², and Henríque S. Nogueira², ¹Danisco Animal Nutrition, DuPont Industrial Biosciences, Paulínia, São Paulo, Brazil, ²Departamento de Zootecnia, FCAV/UNESP, Jaboticabal, São Paulo, Brazil.

The effect of xylanase and β-glucanase has already been proven in broilers fed diets containing high levels of soluble non-starch polysaccharides (NSP). However, soluble and total NSP content in corn and soybean meal are low compared with viscous cereals, and therefore, diets having large proportions of corn are not expected to show significant improvement when supplemented with NSP enzymes. A trial was conducted to verify the effect of xylanase + β-glucanase (XB) on the performance and digestibility of broilers fed corn/soybean meal diet (=3.3% total arabinoxylan) and to determine its optimum inclusion level. A total of 1,440 Cobb 500 male chicks were divided into 6 treatments with 8 replicate pens of 30 birds each distributed in a completely randomized design. Treatments consisted of Positive Control (PC; diet meeting the nutritional requirements of the birds, with no enzyme); Negative Control (NC; reduction of 120 kcal/kg ME in starter phase, and 150 kcal/kg in finisher phase, with no enzyme); NC + 610 + 76U/kg; NC + 1,220 + 152U/kg; NC + 1,830 + 228U/kg; NC + 2,440 + 304U/kg xylanase+β-glucanase, respectively. Performance parameters were evaluated during starter (1–21 d), finisher phase (21–42 d), and the entire period (1–42 d). Apparent digestible energy (ADE) and ileal digestibility of nitrogen (N) and dry matter (DM) were determined at 21 d of age. All parameters were evaluated by Tukey test with 5% of significance. The supplementation of 1,830 + 228U/kg XB was able to increase (P < 0.01) BWG in finisher phase (5.8%) and the entire period (4.9%), when compared with NC. The same enzyme level also showed similar FCR (P > 0.01) as PC in finisher phase. When evaluating digestibility of the diets, 1,830 + 228 and 2,440 + 304U/kg XB showed similar DM digestibility and ADE as PC. The level of 1,830 + 228U/kg XB also showed similar N digestibility as PC. Although there is no protease in this enzyme product, the cell wall breakdown caused by XB likely contributed to better access to protein and starch in cells, improving digestibility and bird performance.

Key Words: apparent digestible energy, carbohydrase, enzyme, ileal digestibility, poultry

199  Effects of full fat soybean meal source and protease on standard amino acids digestibility in broilers. Vinicius Duarte de Oliveira¹,², Maurilio de Lucas Xavier Junior¹, Luiz Fernando Teixeira Albino¹, Horácio Santiago Rostagno¹, Anelcir Scher¹, José Otávio Berti Sorbara¹, and Vitó Barbosa Fasciná³,¹Universidade Federal de Viçosa, Viçosa, MG, Brazil, ²Universidade Estadual Paulista, Jaboticabal, SP, Brazil, ³JBS Foods, São Paulo, SP, Brazil, ⁴DSM Nutritional Products, São Paulo, SP, Brazil.

A study was conducted to evaluate the effects of an exogenous protease on amino acids digestibility in 9 different full fat soybean meal (FFSB) in Brazil. A total of 1,120 males, Cobb 500, 24 d old chicks were allocated in metabolic cages. The experiment was a factorial arrangement with 9 X 2 (FFSB x protease inclusion – 0 and 15,000 PROT/kg feed - RONOZYMProAct, DSM Nutritional Products), plus a Protein Free Diet (PFD) with and without protease. There were 20 experimental diets (treatments), with 8 replicates and 7 birds each. The design was conducted in 2 blocks with 4 replicates per treatment in each block, under the same conditions just separated by time. PFD was formulated to determine the amino acid endogenous losses, while in the rest of the diets, 40% of the starch was replaced with a soybean product, according to the treatment. Protease was added on top. For all diets, 1% of acid insoluble ash was added as an indigestible marker. At 28 d of age, all birds were euthanized by cervical dislocation to collect ileal content. Data were submitted to ANOVA, and means were compared by Tukey test (P < 0.05). It was observed interaction (P < 0.05) between FFSB and protease to standard Met digestibility. The sample number 8 of FFSB (36.33% CP and 0.502% total Met) with or without protease supplementation showed lower Met digestibility when compared with other FFSB. The different sources of FFSB differ amino acid digestibility (P < 0.05). Supplementation with protease led to improvements in the standard of amino acid digestibility (P < 0.05). Protease increases +0.75% Lys, +0.98% Thr, +0.30% Met, +0.62% TAAS, +0.35% Val, +0.96% Ile, +0.37% Leu, +0.53% total aas, +0.23% essential aas, +0.98% no-essential aas, and +0.34% CP. Protease supplementation improves the digestibility of amino acids in different FFSB.

Acknowledgments: DSM Nutritional Products, JBS Foods, Fapesp, UFV e Capes

Key Words: protease, protein free diet, soybean, vegetal protein


A study was conducted to evaluate the effects of an enzyme complex (EC) composed by carbohydrases on growth performance and energy utilization of broilers. A total of 2,016 1-d-old male chicks Cobb 500 x Cobb 500 were allocated into 72 floor pens, distributed in a completely randomized design with 9 treatments, 8 replicates and 28 birds per pen. Corn-soybean meal diets were formulated using 1% of celite as a indigestible marker. Treatments consisted of a control diet formulated with industry levels of apparent metabolizable energy (AME) and digestible amino acids (AA dig.) without the addition of the EC, and 8 diets with reductions of AME (- 80 kcal/kg or - 120 kcal/kg) and AA dig. (-3% and -6%). Diets with energy and AA dig. reductions were supplemented or not with 50 mg/kg of an carbohydrase complex (Rovabio T-Flex Advanced, Adisseo). A 3 phase feeding program was used: starter (1 to 21 d), grower (22 to 35 d) and finisher (36 to 42 d). Body weight gain (BWG), feed intake (FI) and feed conversion ratio corrected for weight of dead birds (FCR) were evaluated at 14, 21, 35, and 42 d. At 21 and 42 d, 4 birds per pen were slaughtered for ileal content collection to determine ileal digestible energy (IDE) and dry matter digestibility (DM). Broilers fed diet with - 120 kcal/kg and - 3% AA dig. supplemented with the CE had lower FCR (P < 0.05) compared with the same energy and AA levels without enzyme supplementation. Birds fed the lowest nutritional levels (- 120 kcal/kg and - 6% AA dig.) with the addition of EC showed higher IDE at 21 d compared with treatment with the same levels without EC supplementation. It was noted higher DM digestibility for the treatment with reductions of 80 kcal/kg and 3% AA dig. with EC in relation to treatment without EC. The supplementation of 50 mg/kg of the carbohydrase complex had improved broiler’s performance and energy utilization. Broilers fed diets with the lowest energy and digest-
ible amino acids levels had the higher digestibility improvements with the carbohydrases supplementation.

Key Words: broiler, carbohydrase, performance, digestibility

201  Enzymatic complex utilization in diets with dry yeast from sugarcane. Regina Fialho de Sousa1, Miliane Alves da Costa2*, Edna Teles Dos Santos1, Leilaine Rocha Barros Dourado1, Mirian Lima Fernandes1, and Rain Malta1, 1University Federal of Paraíba, Bananeiras, Paraíba, Brazil, 2DSM Brazil Ltda, Indaiatuba, São Paulo, Brazil.

The objective of this study was to evaluate the use of enzymatic complex in diets with dry yeast sugarcane (Saccharomyces cerevisiae) on the growth performance of broiler chickens in the period 1–21 d of age. A total of 700 male day-old Cobb 500 chicks were distributed in 35 pens in a completely randomized design 2 × 3 factorial, with 2 levels of enzymatic complex (0 and 200 g/ton); 3 yeast inclusion levels (0, 6 and 12%), with 7 treatments and 5 replicates of 20 birds each. The enzymatic complex was composed of α-galactosidase, galactomannans, xylanase and β-glucanase. At 21 d of age weight gain (WG), feed intake (FI) and feed conversion ratio (FCR) were measured. Data were subjected to ANOVA and the means were compared using SNK test (P < 0.05).

Key Words: Saccharomyces cerevisiae, galactomannan, xylanase, β-glucanase

202  Effect of enzyme blend in diets on performance of broiler chickens. João P. S. S. Silva1, José H. Vilar Da Silva4*, José Jordão Filho1, Vitor B. Fascina2, Thiago S. Melo1, and Silvana C. L. Santos1, 1Federal University of Paraíba, Bananeira, Paraíba, Brazil, 2DSM Nutritional Products, São Paulo, São Paulo, Brazil.

A study was conducted to examine the effects of enzymes blend (EB) in a diet with reduction of nutrients on performance of chickens. A total of 900 chicks, males SF-COBB 500, were fed 6 dietary treatments of 8–21 d old. Positive control diet (PC) had 21.2% CP, 3,050 kcal/kg AME, 0.84% Ca, 0.40% P, 1.22% DLys, 0.88% DMet+Cys, 0.79% DThr and 0.24% DTnp, however, negative control diet (NC) had 2.55% of reduction of AME (80 kcal/kg), CP (−0.25%), DLys (−0.11%), DMet+Cys (−0.02%), DThr (−0.02%), Ca (−0.02%), P (0.01%) and 3.75% of reduction of DTnp (−0.009%), NC+EB1 (15,000 PROT/kg of protease + 80 KNU/kg amylase + 1,000 FTY/kg phytase), NC+EB2 (15,000 PROT/kg protease + 80 KNU/kg amylase + 2,500 FTY/kg phytase), NC+EB3 (15,000 PROT/kg protease + 80 KNU/kg amylase + 1,000 FTY/kg phytase + 100 FXU/kg xylanase), and NC+EB4 (15,000 PROT/kg protease + 80 KNU/kg amylase + 2,500 FTY/kg phytase + 100 FXU/kg xylanase) were arranged in completely randomized design, each of 6 treatments had 10 replicates of 15 chicks. The chicks group fed PC, NC+EB1, NC+EB2, NC+EB3, NC+EB4 had, respectively better WG (911.20a, 910.95a, 984.90a, 902.04a, 915.50a, and 860.95b g) and FCR (1.171b, 1.186b, 1.207b, 1.190b, 1.168b and 1.266a g/g) compared NC (P < 0.01). However, chicks group fed NC diet supplemented with all EB presented same performance of chicks group fed PC diet (P > 0.05). The supplementation with protease, amylase, phytase and xylanase of diets based on corn-soybean meal with reduction mean of 2.5% in AME, CP, EAA, Ca and ap improves broiler performance.

Key Words: corn, enzyme, nutrient reduction, soybean meal

203  Effect of feeding different sources of exogenous proteases in broilers diets containing 1000 FTUs of phytase. Ricardo Gonzalez-Esquerra9*, Raquel Araujo1, Douglas Haese2, João Luís Kill3, Dawster Sant’Anna2, and Carolina Possatti1, 1Novus do Brazil Ltda, Indaiatuba, São Paulo, Brazil, 2Universidade Vila Velha, Vila Velha, ES, Brazil, 3Centro de Tecnologia Animal Ltda, Domingos Martins, ES, Brazil.

An experiment was conducted to evaluate the effect of commercial proteases on broiler performance in diets with phytase supplemented at 1000 FTU’s. A total of 3,325 Cobb 500 d-old male chicks were randomly assigned to 5 treatments of 19 replicates each. Treatments consisted of a Positive Control (PC), Negative Control (NC, with 5% reduction in AAs and 50kcal vs. PC) and NC plus one of 3 Proteases (Prot-A, Prot-B or Prot-C fed at 500, 200 and 125g per ton according to manufacturers’ recommendations, respectively). Phytase (Phytase, Novus International Inc.) was included in all diets at 1000 FTUs and formulated at 0.19% of Av. P and Ca, plus AA and ME. A density of 10 birds/m², reused litter, and commercial-like feeder space were imposed to broilers fed mash Corn/SBM/Meat and bone meal/Poultry by-product meal based diets. Performance was evaluated at the end of each feeding phase (14, 28 and 42d). Carcass, breast and pancreas percentages from 4 birds/pen were evaluated at 42d. Data were analyzed by ANOVA and Tukey Test. At d 14, BWG was higher for PC and FCR was better for PC and Prot-A compared with Prot-C (P < 0.01). Prot-A improved FCR at levels similar to PC and greater than NC and Prot-B (P < 0.01) at 28d. Proteases tested did not present differences among them for BWG at 42d, but Prot-A was the only significantly different (P < 0.05) from NC. Prot-A improved FCR compared with NC, Prot-B and Prot-C (P < 0.01), reaching PC results (P > 0.05). European efficiency index was significantly higher (P < 0.01) for PC and Prot-A compared with NC and Prot-C. Feed intake was unaffected by treatments in any age (P > 0.05). The BW of the sampled birds did not resemble treatment averages, reflecting the challenges to obtain representative samples of birds. Carcass yield was higher for Prot-B than PC, NC and Prot-C (P < 0.05) but not different from Prot-A; while breast yield was lower for Prot-B vs. all other treatments (P > 0.01). Pancreas percentage did not present differences (P > 0.05). These results suggest that proteases promote additional benefits in diets containing with 1000 FTUs phytase and that Protease Prot-A was most effective.

Key Words: protease, phytase, performance, broiler

204  Effect of an exogenous protease on the standardized ileal digestibility of soybean meal and feather meal in semipurified diets fed to broiler chickens. Luke P. Barnard9*, Ahmed M. Amerah1, Luis F. Romero1, and Nilva K. Sakomura2, 1DuPont

Poult. Sci. 95(E-Suppl. 2) 85
The aim was to investigate the effect of an exogenous subtilisin protease enzyme on the standardised ileal digestibility of crude protein (CP) and amino acids (AA) of soybean meal (SBM) and feather meal (FM) in broilers fed semi-purified diets. There were 5 treatments; 1. A protein free diet (PFD), 2. PFD + SBM, 3. PFD + SBM + 10,000U/kg subtilisin protease (from Danisco Animal Nutrition, DuPont Industrial Biosciences), 4. PFD + FM, 5. PFD + FM + 10,000U/kg subtilisin protease. Each treatment was replicated 9 times with 15 birds/ replicate (20 birds/ replicate for PFD treatment); test diets were fed from d15–21. Treatments 2–4 were formulated to be isonitrogenous (20% CP); dietary energy was provided by corn starch and soy oil, celite was used as an inert marker. Feed and water was available ad libitum for the duration of the study. At study termination, birds were euthanized and contents of the lower ileum were collected by gentle flushing with distilled water. Digesta and diets were analyzed for CP, AA and celite to calculate digestibility. Data were analyzed using JMP 11.0 and significance was considered at $P < 0.05$. Protease significantly increased ileal CP digestibility of FM from 73.4% to 76.5%, and numerically ($P > 0.05$) improved ileal CP digestibility of SBM from 86.4% to 88.1%. This corresponded to an increase in the digestibility of the undigested fraction of CP by 20.2 and 12.3% for FM and SBM, respectively. There was a significant positive correlation between the apparent undigested fraction of an AA and the increase in digestibility of that AA with protease supplementation for SBM ($R^2 = 0.45, P < 0.05$). This work showed that exogenous subtilisin protease can increase ileal CP digestibility of FM. In SBM, the uplift in AA digestibility from protease was linked to the inherent digestibility of the AA in the ingredient.

**Key Words:** Broilers, protease, protein, amino acids, digestibility

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The aim was to investigate the effect of an exogenous subtilisin protease enzyme on the standardised ileal digestibility of crude protein (CP) and amino acids (AA) of rapeseed meal (RSM) and meat and bone meal (MBM) in broilers fed semi-purified diets. There were 5 treatments; 1. A protein free diet (PFD), 2. PFD + RSM, 3. PFD + RSM + 8,000U/kg subtilisin protease (from Danisco Animal Nutrition, DuPont Industrial Biosciences), 4. PFD + MBM, 5. PFD + MBM + 8,000U/kg subtilisin protease. Each treatment was replicated 8 times with 4 birds/ replicate; test diets were fed from d25–34. Treatments 2–4 were formulated to be isonitrogenous (18% CP); dietary energy was provided by corn starch and soy oil, TiO$_2$ was used as an inert marker. Feed and water was available ad libitum for the duration of the study. At study termination, birds were euthanized and contents of the lower ileum were collected by gentle flushing with distilled water. Digesta and diets were analyzed for CP, AA and an inert marker to calculate digestibility. Data were analyzed using JMP 11.0 and significance was considered at $P < 0.05$. Protease increased ileal CP digestibility of RSM and MBM ($P < 0.05$). There was an increase in the digestibility of the undigested fraction of CP by 11.7 and 16.5% for RSM and MBM, respectively. There were also significant positive correlations between the apparent undigested fraction of an AA and the increase in digestibility of that AA with protease supplementation, for RSM ($R^2 = 0.67, P < 0.05$) and MBM ($R^2 = 0.49, P < 0.05$). This work showed that exogenous subtilisin protease can significantly increase ileal CP digestibility of RSM and MBM. The magnitude of the response to protease was different on different ingredients. The response to the protease on AA digestibility depended on the inherent digestibility of the AA without protease supplementation.

**Key Words:** Broilers, protease, protein, amino acid, digestibility