

Metabolism and Nutrition: Enzymes

P338 Incorporation of wheat distillers dried grains with solubles and a cocktail of exogenous enzymes in the rations of Hy-Line W-36 hens. E. F. Nomali, H. Kermanshahi,* A. Tahmasbi, H. N. Moghaddam, and A. Gilani, *Ferdowsi University of Mashhad, Mashhad, Khorasan Razavi Province, Iran.*

Wheat distillers dried grains with solubles (WDDGS) is a by-product that can be an alternative feed ingredient for poultry. However, WDDGS contains non-starch polysaccharides which limit its dietary inclusion. The objective of the current trial was to evaluate the effect of WDDGS with or without Endofeed W on egg quality and performance of laying hens. Endofeed W is a commercial enzyme including arabinoxylanase and β -glucanase. A factorial arrangement in a completely randomized design with 4 replicates consisting of 5 levels of WDDGS (0, 5, 10, 15 and 20%) and 2 levels of Endofeed W (0 and 0.05%) were evaluated. Ten mash diets were fed to 320 commercial Hy-Line W-36 hens from 51 weeks of age for 12 weeks. Each experimental unit consisted of 2 cages with 4 birds each. Performance criteria, such as feed intake, body weight and egg production, were monitored during the trial. Four eggs were randomly selected from each experimental unit to measure egg characteristics every other week. The data were analyzed using the GLM procedure of SAS. Hens fed diets containing WDDGS produced eggs lower on the Roche Yolk Color Fan scale. Endofeed W significantly ($P < 0.05$) improved overall feed efficiency and daily egg mass. There was no significant effect of WDDGS, Endofeed W or their interaction on hen-day egg production, egg weight, egg specific gravity, shell weight percentage, shell thickness and percentage of soft-shelled and cracked or broken eggs. In conclusion, WDDGS can be partly included in layer's diet.

Key Words: WDDGS, Endofeed W, laying hens, egg

P339 Withdrawn.

P340 Protease improves performance and energy utilization in broilers fed diets with high tannin sorghum. J. G. Carvajal*^{1,2}, K. A. Rincón¹, and E. O. Oviedo-Rondón^{1,3}, ¹*Universidad del Tolima, Ibagué, Tolima, Colombia*, ²*Novus International, Bogotá D.C., Colombia*, ³*North Carolina State University, Raleigh.*

Sorghum is an important feedstuff in many regions of the world. High karfirin levels in sorghum varieties with high tannin contents may limit their use. Protease enzymes may help to break-down disulfide-bonds in karfirins and improve sorghum starch digestibility and broiler live performance. One experiment was conducted to evaluate the effects of adding a protease (CIBENZA DP100) in diets with increasing inclusion levels of high tannin sorghum (1.63% of catechine equivalents). Eight dietary treatments were evaluated resulting from a 4x2 factorial design with sorghum inclusion level (0, 10, 20 and 30%) and enzyme supplementation (0 or 500 g/ton for 600,000 U/g) as main factors. Diets were formulated to have similar nutrient composition within both phases evaluated. Starter and grower diets were fed in small and large crumbles, respectively. Celite was added as marker to grower diets. All diets contained phytase and endoxylanase. A total of 448 d-old male Cobb-Avian broilers were individually identified and randomly assigned to 32 floor pens in groups of 14 per pen and 4 pens per treatment combination. Individual BW and feed intake were recorded weekly up to 6

wk of age. The BWG, FCR and flock uniformity were calculated. Distal ileal contents were collected at 42d to estimate ileal digestible energy (IDE). Results indicated no significant ($P > 0.05$) interaction effects. Independent effects ($P < 0.05$) of sorghum level and enzyme supplementation were observed in all phases evaluated. The BWG and FCR were linearly ($P < 0.05$) worsened as sorghum inclusion increased. Protease addition improved ($P < 0.05$) performance at all sorghum levels and even in the control diets without sorghum in every period evaluated. Broilers fed diets with protease were 270 g heavier (2,626 vs 2,356) and needed 115 g less of feed per kg of BW (1.706 vs 1.821 FCR) at 42d. The IDE of all diets improved ($P < 0.001$) on 74 kcal due to protease addition. This protease improved the IDE of broiler diets with and without sorghum. It was concluded that the detrimental effects of high tannin sorghum inclusion could be overcome by addition of this protease.

Key Words: sorghum, high tannin, protease enzyme, IDE, broiler performance

P341 Recombinant expression of *Bacillus subtilis* phytase improves phytate degradation of *Lactobacillus*. T. E. Askelson,* J. T. Lee, and T. Duong, *Texas A&M University, College Station.*

Livestock animal feed is commonly supplemented with phytase to increase bioavailability of phytate bound phosphorous. Probiotics, sometimes called direct fed microbials, are live microorganisms administered to confer a health benefit upon the host. When used in poultry production, probiotics are effective in promoting growth and reducing gastrointestinal colonization by microbial pathogens. The goal of this study is to investigate phytate degradation as a novel probiotic functionality using the recombinant expression of *Bacillus subtilis* phytase in *Lactobacillus*. *Bacillus subtilis phy* was codon optimized for expression in *Lactobacillus* and cloned into the expression vector, pTRK882. The resulting plasmid, pTD003, was transformed into *Lactobacillus acidophilus* NCFM, *Lactobacillus gallinarum* ATCC 33319 and *Lactobacillus gasseri* ATCC 33323. SDS-PAGE revealed an approximately 44 kDa protein in the culture supernatants of *Lactobacillus* harboring pTD003. The phytate degrading capability of these strains was evaluated by determining the amount of inorganic phosphate released from sodium phytate. Phytase activity of *Lactobacillus* strains transformed with pTD003 was 3–5 times greater than the background activity of the empty vector controls. *Lactobacillus acidophilus* and *L. gasseri* produced similar levels of phytase activity while *L. gallinarum* produced less activity. The use of phytate degrading probiotics in poultry production is anticipated to provide the benefits of both probiotics and phytase in a single feed supplement.

Key Words: phytate, phytase, *Lactobacillus*, *Bacillus*, probiotics

P342 Comparison of different levels of canola seed on AST enzyme, glucose and cholesterol of broiler's blood. W. Andalibi*¹, S. Moradi¹, and B. Darabighane², ¹*Department of Animal Science, University of Zanjan, Zanjan, Iran*, ²*Department of Animal Science, Karaj Branch, Islamic Azad University, Karaj, Iran.*

This study is to evaluate the effects of different levels of canola seed on AST enzyme (aspartate transaminase is an important enzyme in amino

acid metabolism), glucose and cholesterol of broiler's blood at the ages of 26 and 41 d. In this study, 180 1-d chickens were tested. This test was included 6 groups, 3 repetitions, and 10 birds which were kept in 18 cages. SAS software was used for statistical analysis. Feed allowances were included control group (without canola) and test groups including 5, 10, 15, 20, and 25 percent of canola seeds, which energy, protein and other feed materials were almost identical. Blood parameters were measured by Hitachi 902 Auto analyzer. The maximum and minimum amount of AST, cholesterol and blood sugar of broilers at the age of 26 d were (169, 271 International unit/l), (94, 112 mg/dL), and (225, 252 mg/dL), respectively which were relevant to the (Control, 25%), (5%, 20%), and (5%, 25%) groups of canola seed. By increasing the percentage of canola seed, AST enzyme showed a significant difference in plasma ($P < 0.01$). Blood sugar at the age of 26 d showed a significant difference ($P < 0.01$) in different levels of seeds but no significant difference was seen at the age of 40 d among the groups. The results showed that AST enzyme was increased at the age of 26 d by increasing in the canola seed of the diet which indicated occurrence of liver diseases. Blood sugar was decreased by increasing in canola seed in the daily diet which indicated the fact that in young ages, high levels of canola seed due to having anti nutrients prevent the poultry to gain the needed energy. At the age of 26 d, the blood cholesterol was decreased by increasing in canola seed level. The main reason was high amount of fiber which accelerated passing substances from digestive system and lowered the feed absorption.

Key Words: broiler, canola seed, AST enzyme, glucose, cholesterol

P343 Thermostability tests of two commercial phytase products. C. Schauerhuber,* S. Henikl, and G. Schatzmayr, *Biomim Research Center, Tulln, Austria*.

Phosphorus is an essential nutrient for animals and is found in plants at sufficient amounts to maintain health, body function and performance. However, the major storage form of phosphorus in plants is the indigestible, organic form of phytic acid (myo-inositol hexakisphosphate). Phytase is a type of phosphatase enzyme that breaks down the phytic acid molecule in the digestive tract and provides the phosphorus for the animals' metabolism. Besides the activity of a phytase product, the thermostability is a crucial property which facilitates its use in animal feed. In contrast to post pelleting enzyme spraying, eased application of phytase prior pelleting is possible. In this study, 2 different commercial phytase products (TV, TT) that claim thermostability were examined and compared with a non-thermostable phytase product (NT) as well as an intrinsically thermostable phytase product (TQ). For the test on thermostability, the enzyme products were dissolved in buffer and heated at 75°C for 5 min. Afterward, the phytase activity was determined by using the ISO 30024:2009 method entitled *Animal Feeding Stuffs - Determination of Phytase Activity*. The positive control TQ proved its high quality and best thermostable properties with a recovery rate of 89.37 ± 5.42%. In comparison, the negative control NT was highly inactivated by heating and showed a recovery rate of 11.92 ± 1.68% ($P = 0.000$). The 2 phytase products TV and TT that were examined showed a recovery rate of 75.31 ± 5.37% and 84.65 ± 6.20%, respectively. The activity of the product TV differed significantly from the negative control NT ($P = 0.000$) and the positive control TQ ($P = 0.030$). Contrary, the activity of the product TT was significantly higher compared with the negative control NT ($P = 0.000$) but not significantly lower compared with the positive control TQ ($P = 0.141$). In conclusion, the claimed thermostability of both commercial phytase products was confirmed and revealed their high potential. In further experiments, the phytase

products will be exposed to different temperatures so that a profile on temperature-sensitive activity can be developed.

Key Words: enzyme activity determination, thermostable properties, ISO 30024:2009

P344 Improving nutritive value of high tannin sorghum for broiler chicks using exogenous protease and phytase. F. Yan*², S. Mutayoba^{1,3}, E. Dierenfeld², and M. Vazquez-Anon², ¹*African Women in Agricultural Research & Development, Nairobi, Kenya*, ²*Novus International Inc., St. Charles, MO*, ³*Sokoine University, Morogoro, Tanzania*.

A study was conducted to evaluate the effect of exogenous protease and phytase on performance of broilers fed diets containing high tannin sorghum (HTS) from Tanzania. The study consisted of 5 dietary treatments: corn control, HTS, HTS + phytase, HTS+ protease (Cibenza DP100, Novus International, Inc.) and HTS + protease + phytase. All diets were formulated on digestible amino acid basis to meet nutrient requirements of broilers. A total of 240 male broiler chicks were randomly allocated to 30 battery pens with 8 birds per pen. Each test diet was fed to 6 replicate pens from 0 to 22 d. Data were analyzed by one way ANOVA with pen as experimental unit and statements of statistical significance were based on $P < 0.05$. On d 14, birds fed HTS diet ate more and were heavier than those in corn control group possibly due to underestimation of amino acid digestibility of HTS, and enzymes did not affect body weight significantly. Feed conversion ratio from 0 to 14 d of birds fed HTS diet was numerically higher than that of birds in corn control group (1.420 for HTS vs. 1.361 for corn); protease and phytase numerically improved FCR to 1.383 and 1.374 respectively. On d 21, body weight was not significantly affected by treatments. Feed conversion ratio from 14 to 21 d was significantly increased for birds fed HTS diet in comparison to that of corn control birds (1.697 for HTS vs. 1.552 for corn). Protease numerically improved 14–21 d FCR and combination of protease and phytase significantly improved it to a level comparable to that observed in corn group (1.619 for protease and 1.540 for protease + phytase). The study showed that, when formulated on digestible amino acid basis, HTS based diet was able to support equal or better body weight of broilers in comparison to corn based diet, but FCR was compromised. Protease alone or in combination with phytase was able to improve the poor FCR associated with HTS.

Key Words: broiler, sorghum, protease, phytase

P345 Phytase supplementation for broiler breeder and its impact on progeny. C. S. S. Araujo,* A. J. T. Kawaoku, L. F. Araujo, R. J. G. Pereira, C. Y. Morimoto, I. S. Yo, C. C. Silva, and E. R. Afonso, *University of Sao Paulo, Sao Paulo, Brazil*.

It is well known the benefits of phytase supplementation for poultry production; however, the impact of maternal diet supplemented with this enzyme on subsequent progeny is lacking. For this reason, the potential of dietary phytase supplementation for broiler breeder and its effect on performance and carcass traits in progeny were evaluated. Two hundred and 40, 24-week-old, Cobb 500 breeders were allocated to 6 dietary groups. The experimental design consisted in a 2X3 factorial arrangement with inclusion or not of phytase (0 and 500 FTU) and 3 levels of available phosphorus (0.1%; 0.2%; 0.3%) in the maternal

diet. Progeny were obtained from eggs set at 35 wk and a total of 720 chicks were placed, as straight-run, into 60 pens (6 treatments, 10 replications, and 12 birds/replication) in a floor pen facility. Chicks had access to water ad libitum and to industry standard mashed diets. Thus, the dietary treatments of the broiler breeder flock represented the progeny treatments, so breeder pen was the experimental unit for the broilers design. Live performance parameters (feed intake, body weight gain and feed conversion ratio) were measured from 1 to 21 and 1 to 43 d. On d 43, 2 birds per pen were selected randomly and processed,

and carcass characteristics were evaluated (breast and legs yield and abdominal fat). There was no interaction between phytase and available phosphorus levels studied for performance. In addition, performance was not affected by any treatments. However, birds from breeders fed 0.3% of available phosphorus plus phytase had better carcass yield ($P < 0.05$). Results showed that supplementation of phytase in broiler breeder diets can affect carcass characteristics of subsequent offspring.

Key Words: carcass yield, enzyme, performance, phosphorus