

Nonruminant Nutrition: DDGS

667 Increased AME and growth performance in broiler chicks fed a high DDGS diet supplemented with a mixture of NSPase. H. B. Lee*, K. L. Price, M. D. Utt, and J. Escobar, *Virginia Polytechnic Institute and State University, Blacksburg.*

High-fiber content of distillers dried grains with soluble (DDGS) is partially responsible for its low ME, which may be increased with dietary inclusion of non-starch polysaccharidase (NSPase). Broiler chicks (7-d-old, 6 chicks/pen, 6–7 pens/diet) were randomly allotted to 4 treatments with free access to feed and water. Corn and DDGS (20%) diets were supplemented or not with a proprietary mixture of NSPase. DDGS diets were formulated to be deficient only in ME (90% of corn diets). In wk 2, average weekly weight gain (AWG), gain:feed, and apparent ME (AME) of the chicks receiving corn diets were higher ($P < 0.001$) than DDGS diets. DDGS+NSPase increased ($P < 0.08$) AME by 9.4% but had no effect on AWG. In wk 3, AWG and gain:feed were higher ($P < 0.001$) in chicks receiving corn diets compared with DDGS diets. NSPase inclusion improved ($P < 0.04$) AWG in both corn (312 vs. 338 g) and DDGS (262 vs. 283 g) diets. DDGS+NSPase increased ($P < 0.007$) AME by 11.7%, which made this diet comparable in energy to both corn diets. However, AWG of chicks fed DDGS+NSPase was lower ($P < 0.005$) than chicks eating the corn diets, regardless of NSPase inclusion. The main effect of NSPase inclusion during the 2-wk assay was an increase in standardized ileal digestibility (SID) of all amino acids ($P < 0.003$). Overall energy restriction reduced SID of Pro, Leu, Phe, and Ala ($P < 0.05$). Regardless of diet, age increased ($P < 0.05$) amino acid SID except for Ser, His, Thr, Val, and Ala. Results indicate the ability of a mixture of NSPase to increase AME of ME-deficient diets containing 20% DDGS. Further, a lag in AWG response at equal AME suggests a metabolic adaptation in birds to the use of the reducing sugars freed by NSPase for growth.

Key Words: non-starch polysaccharidase, apparent metabolizable energy, amino acid standardized ileal digestibility

668 Effects of heat treating soybean meal and DDGS on ileal amino acid digestibility in broilers. A. Helmbrecht*¹, H. Kluth², A. Lemme¹, M. S. Redshaw¹, and M. Rodehutschord³, ¹*Evonik Degussa GmbH, Hanau, Germany*, ²*University Halle-Wittenberg, Halle-Wittenberg, Germany*, ³*University Hohenheim, Stuttgart, Germany*.

The objective was to study effects of extreme feed conditioning on ileal amino acid (AA) digestibility of protein sources in broilers. Soybean meal (SBM) and corn DDGS were subjected to heat (135°C) in combination with steam in an autoclave system for 20 or 40 min. Each of the untreated and treated ingredients was included at 0, 10 or 20% into a basal diet at the expense of corn starch. Ileal AA digestibility both of SBM and of DDGS were finally calculated by linear regression analysis resulting in digestibility coefficients which are independent of endogenous losses. Ileal AA digestibility was studied in 2 experiments utilizing 3-week-old broilers and using TiO₂ as the indigestible marker. Each dietary treatment was allocated to 6 pens of 10 birds each. Feeds and water were offered for ad libitum intake for 5 d. For SBM, the 20-min heat treatment caused a significant reduction in digestibility of all AA, and the 40-min treatment caused a further significant reduction in digestibility for 6 out of 17 AA studied ($P < 0.001$). Mean digestibility of Arg, His, Ile, Leu, Lys, Met, Phe, Thr, Trp and Val was reduced from 82% (control) to 68% (20 min) and 62% (40 min). For DDGS the treatment effects were not as great as for SBM. However, the mean digestibility of the aforementioned AA was 85% (control),

80% (20 min) and 79% (40 min). The effect of 20-min treatment of DDGS was significant for 11 out of 17 AA studied ($P < 0.001$). It was concluded that extreme conditions in feed conditioning will reduce AA digestibility greatly. The magnitude of the effect depends on the origin of the protein in the diet.

Key Words: amino acid digestibility, broiler, heat treatment

669 High dietary inclusion of dried distillers grains with solubles in broiler chick rations in combination with AllzymeSSF enzyme—Effects on yield and endogenous enzyme levels. M. K. Masa¹deh*¹, C. A. Fassbinder-Orth², and S. E. Scheideler¹, ¹*University of Nebraska-Lincoln, Lincoln*, ²*Creighton University, Omaha, NE*.

A study was conducted to test the effects of feeding high levels of dried distillers grains with solubles (DDGS) in combination with AllzymeSSF enzyme on production parameters and endogenous enzyme activity in broiler chicks. 480 d-old broiler chicks were divided into 8 diets (15 chicks per pen) with 4 replicate pens from day-old to 43 d. Chicks were fed 4 DDGS levels (0, 10.0, 20.0, or 30.0%) and 2 levels of the enzyme AllzymeSSF (0, or 0.02%) having activities of phytase, protease, pentosanase, pectinase, cellulase, beta-glucanase, and amylase in 4 × 2 factorial design. All diets were formulated to be isocaloric and isonitrogenous with the enzyme treatments replacing 75 kcal/kg ME, 0.1% Ca, and 0.1 P. All diets were fed a phase-feeding program, starter (0–15 d), grower (15–30 d), and finisher (30–43 d). At 43 d, 2 birds per pen were selected for yield %, parts yields and enzyme activities of amylase, maltase, aminopeptidase, trypsin and chymotrypsin from intestinal and pancreatic tissues. The dietary enzyme by DDGS interaction was not different ($P > 0.05$) for production parameters, mortality, yield % and tissue enzyme activities. Percent carcass yield ($P > 0.05$) was no different between treatments. Parts yield were not affected ($P > 0.05$) by dietary treatments except for breast yield as a % of carcass wt ($P < 0.05$) with the highest yield for broiler fed 10% DDGS. Endogenous enzyme activity levels in the intestine and pancreas were not different ($P > 0.05$) between DDGS levels. However, AllzymeSSF enzyme increased endogenous amylase activity ($P < 0.1$) in the enzyme treatments compared with non-enzyme treatment. In summary, feeding DDGS at higher levels, up to 30% in combination with AllzymeSSF enzyme, did not negatively affect production parameters or % yield compared with the basal diet. Exogenous enzyme supplementation appears to positively influence endogenous enzyme activity. Feeding DDGS at 30% had an economical benefit on average of \$60/ton compared with the basal diet (0% DDGS). In addition, feeding the AllzymeSSF enzyme has an economical benefit of \$14/ton.

Key Words: DDGS, AllzymeSSF, amylase

670 Effect of exogenous enzyme supplementation on performance and carcass characteristics of broilers fed distillers dried grains with solubles (DDGS). B. Jung*¹, A. B. Batal¹, and R. Mitchell², ¹*University of Georgia, Athens*, ²*Perdue Farms, Inc., Salisbury, MD*.

An experiment was conducted to determine the effect of supplementing with exogenous enzymes on performance, gastrointestinal tract weights and carcass characteristics of broilers fed diets containing distillers dried grains with soluble (DDGS). In a 3 × 2 factorial design 1,920 one-day-old male Heritage broilers were randomly assigned to the 6 dietary treatments; Corn-soybean meal (SBM), Corn-SBM + Hemicell, Corn-SBM + Avizyme 1510, 12% DDGS, 12% DDGS+ Hemicell, and 12% DDGS+

Avizyme 1510. Eight replicate pens containing 40 chicks were fed each experimental diet from 0 to 50 d of age. The diets were formulated to be isocaloric and isonitrogenous and to meet the bird's digestible amino acid requirements. Performance was evaluated at 14, 21, 36 and 50 d of age, gastrointestinal tract weights were measured at 21 and 50 d of age, and carcass characteristics were measured at 51 d of age. From 0 to 36 d of age the inclusion of 12% DDGS in the diets decreased ($P < 0.05$) BW gain and feed efficiency (gain: feed). The supplementation of enzymes (Hemicell and Avzyme) to the corn-SBM and 12% DDGS diets increased ($P < 0.05$) BW gain and feed efficiency. The birds fed the diets with DDGS had significant heavier ($P < 0.05$) relative proventriculus and small intestinal weights, but the supplementation with enzymes did not affect the relative gastrointestinal tract weights at 21 d of age. There was no interaction between DDGS and enzymes on performance and gastrointestinal tract weights. The carcass data are being conducted. Careful consideration should be given when 12% DDGS is fed to broilers due to negative effects on performance and the addition of enzymes to the DDGS diets may overcome this negative effect.

Key Words: distillers dried grains with solubles (DDGS), broilers, performance

671 Effects of varying levels of DDGS on broiler growth and intestinal content characteristics at 28 days post-hatch. R. E. Loar II*, J. R. Donaldson, and A. Corzo, *Mississippi State University, MS.*

A study comprised as a factorial arrangement of treatments consisted of a starter (0 vs. 8%) and grower (0, 7.5, 15, 22.5, 30%) feed phases with various DDGS inclusion levels that served as the factors evaluated. 1,350 Ross × Ross 708 male chicks were placed in floor pens (15 birds/pen) and randomly assigned to a starter phase diet from placement until 14 d of age, and subsequently a grower phase diet (14–28 d). Birds were collectively weighed at d 0, 14 and 28 d. Feed consumption and mortality were monitored throughout the study. At the conclusion of the grower phase, the cecal contents from one randomly selected bird were analyzed for *Clostridium perfringens* and *Escherichia coli* growth through both selective media and real-time PCR. Two additional birds were randomly selected from each pen, their liver weights determined, and their ileal contents measured for viscosity. Our results indicated that DDGS levels had no effects during the starter phase. Birds exhibited a linear decrease in BW gain ($P < 0.0001$) and liver relative weight ($P < 0.0004$) as dietary DDGS were increased in the grower phase. Feed conversion and mortality were unaffected by DDGS grower phase level. A DDGS starter × grower phase interaction ($P < 0.05$) was observed for feed consumption during the grower phase, where birds that consumed no DDGS during the starter phase exhibited a decrease in feed consumption at 22.5 and 30%, while birds that received 8% DDGS during the starter phase were unaffected by DDGS during the grower phase. Broilers were unaffected by DDGS grower phase levels for ileal viscosity, and cecal *C. perfringens* and *E. coli* concentrations. Results from this study suggest that young broilers remain susceptible to high levels of DDGS inclusion during the 14 to 28 d feeding period.

Key Words: DDGS, broiler, PCR

672 Effect of distillers dried grains with solubles and enzyme supplementation on production performance and egg quality of laying hens through 36 weeks of egg production. P. Rossi*, A. J. Pescatore, A. H. Cantor, J. L. Pierce, T. Ao, L. M. Macalintal, M. J. Ford, W. D. King, and H. D. Gillespie, *Alltech-University of Kentucky Nutrition Research Alliance, Lexington*

The effects of diets containing 15 or 23% distillers dried grains with solubles (DDGS) with and without a naturally occurring enzyme complex (Allzyme SSF, Alltech Inc., Nicholasville, KY) on performance and egg quality of laying hens was evaluated during 36 weeks of production. At 17 weeks of age, 420 Hy-Line W-36 hens were randomly assigned to 5 treatments with 7 replicate groups of 12 hens each. Treatments consisted of feeding the following diets: 1) positive control (corn-soybean meal), 2) 15% DDGS, 3) 15% DDGS + enzymes, 4) 23% DDGS, and 5) 23% DDGS + enzymes. Diets containing DDGS had reduced levels of ME (2800 vs. 2877 Kcal/kg), Ca (4.1 vs. 4.2%) and available P (0.17% for 15% DDGS or 0.2% for 23% DDGS vs. 0.29%), compared with the control diet. Six eggs were randomly collected from each replicate every 4 weeks to determine egg quality. Feed intake was significantly ($P < 0.05$) decreased by DDGS during wk 9–12, 17–20 and 25–28. During the 36 weeks of production Allzyme SSF reduced feed intake by 2.6 g/hen/d. Hen-day production was lower for DDGS + enzymes during wk 29–32. There was no effect of treatments on feed efficiency. Egg weight at wk 8, 12, 16 and 20 and shell weight at wk 12 were decreased by 23% DDGS. The diet with 15% DDGS + enzymes increased yolk weight at wk 12 and 16 and % yolk at wk 16. Albumen weight was significantly increased by 15% DDGS at wk 8 and 16. Hens fed 15 or 23% DDGS +/- enzymes, had lower yolk lightness (L*) vs. hens fed the control diet. Hens fed 23% DDGS had higher yolk redness (a*) and yellowness (b*) values vs. hens fed 15% DDGS or the control diet, indicating a darker yolk color. The current study suggests that DDGS can be included in the diet up to 23% with minimal effects on performance and egg quality and can be used to improve yolk color. Using Allzyme SSF in DDGS diets with lower nutrient density can reduce feed intake. Feeding diets with 15% DDGS plus Allzyme SSF increased yolk weight and percent yolk.

Key Words: DDGS, yolk color, egg quality

673 Effects of high concentrations of distillers dried grains with solubles on long-term laying hen performance. J. Green*, D. U. Ahn, and M. E. Persia, *Iowa State University, Ames.*

A 28-week study was conducted with 240 Hy-Line W-36 laying hens to investigate the effects of long-term feeding of high concentrations of corn distillers dried grain with solubles (DDGS) on hen performance (egg production, feed intake). The experimental treatments consisted of 10 replicate groups of 6 hens housed in 2 hens per cage in 3 consecutive cages. The 4 dietary treatments consisted of increasing percentage of DDGS (0, 17%, 35%, and 50%) formulated into a corn-soybean meal (SBM) based diet. The DDGS were obtained from a local ethanol plant and all diets were formulated to be isocaloric and to meet or exceed industry based nutrient requirements. Crude protein content of the diets was allowed to increase with increasing dietary concentrations of DDGS. Hens were secured from a local commercial facility at 72 weeks of age after having gone through a molt period. Hens were started on 12 h of light with a half-hour increase weekly until hens reached 16 h of light daily. Hens were fed corn-SBM diets for 2 weeks before being stair-stepped up to 50% DDGS diets after a 2-week adjustment period to higher DDGS diets. Egg production and mortality data were collected and recorded daily, feed intake and egg production were analyzed weekly, while body weight gain was determined monthly. After 24 of 28 weeks on the 0, 17, 35 and 50% DDGS diets, total egg production was 89.2, 84.0, 86.8 and 63.5%, respectively. Feed intake for this period mirrored egg production at 104.1, 101.7, 105.4, and 91.6 g of feed intake per hen per day for the 0, 17, 35 and 50% DDGS diets, respectively. The reduction in feed intake and egg production with the 50% DDGS diet is most likely due to a methionine deficiency. Longer

term laying hen performance is possible with diets formulated to contain higher concentrations of dietary DDGS, but care must be taken to ensure adequate amino acid utilization when including this highly variable feed ingredient into laying hen diets.

Key Words: laying hen, DDGS, egg production

674 Effects of high concentrations of dried distillers grains with solubles on intestinal structure and nutrient and endotoxin transport of laying hens. K Gudenkauf*, M Jeffrey, N. K Gabler, D. U Ahn, and M. E Persia, *Iowa State University, Ames.*

The objective of this research is to determine the effects of high concentrations of dried distillers grains with soluble (DDGS) on nutrient and endotoxin transport of laying hens. Second-cycle laying hens were fed corn-soybean meal based diets containing either 0 or 50% DDGS for one month. Both diets were formulated to meet minimum total amino acid requirements regardless of crude protein content and equal energy concentrations. Eight hens per dietary treatment were sacrificed and intestinal tissue samples were collected from the duodenum loop (duodenum) and the midpoint between Meckel's diverticulum and the ileo-cecal junction (ileum). Fresh segments of ileum were collected and mounted in modified Ussing chambers to measure mucosal to serosal glucose, glutamine, phosphate, lysine, and methionine (met) transport rates. The changes in electro-physiology for each tissue were calculated after each nutrient challenge. Furthermore, permeability and tight junction integrity were also assessed by measuring the transepithelial electrical resistance (TEER). Statistical analysis was carried out using ANOVA. In general, nutrient transport was unaltered by diet although met transport rate tended to be increased by the 50% DDGS diet ($P = 0.10$), likely due to met deficiency in the 50% DDGS diet. No differences were noted in TEER. Lastly, ileal and colon samples were also mounted in modified Ussing chambers and mucosal to serosal endotoxin transport rates were determined using fluorescein isothiocyanate labeled lipopolysaccharide. The diet did not alter ileum endotoxin transport, but the 50% DDGS diets resulted in a significant decrease in colon endotoxin transport ($P \leq 0.05$). These data may indicate that the increased fiber in the DDGS diet is stimulating colon health resulting in decreased endotoxin transport.

Key Words: DDGS, laying hen, endotoxin transport

675 Effects of extruding DDGS at high and low temperatures on nutritional value of diets for nursery pigs. S. M. Williams*, J. D. Hancock, S. Issa, C. B. Paulk, and T. L. Gugle, *Kansas State University, Manhattan.*

A total of 224 nursery pigs (112 barrows and 112 gilts with an average initial BW of 8.4 kg) were used in a 21-d experiment to determine the effects of extrusion processing on the nutritional value of DDGS. The pigs were weaned, blocked by weight, and allotted by sex and ancestry with 7 pigs/pen and 8 pens/treatment. All pigs were fed a common diet for 11 d post weaning and the experimental treatments for the next 21 d. Treatments were a corn-soybean meal-based control and 3 diets formulated with 30% DDGS. For the DDGS treatments, the DDGS were not extruded, extruded with the barrel configured for processing cereal grain (to generate less shear and temperature rise), and extruded with the barrel configured for processing soybeans (to generate more shear and temperature rise). Orthogonal contrasts were used to separate treatment means with comparisons of: 1) the control vs. DDGS treatments; 2) untreated DDGS vs. extruded DDGS; and 3) low shear vs. high shear extrusion of the DDGS. For d 0 to 21, ADG and ADFI were greater for pigs fed the corn-soy control compared with pigs fed the DDGS treat-

ments ($P < 0.02$). Extruding the DDGS did not affect ADG or G:F ($P > 0.11$) and there were no differences in growth performance among pigs fed the DDGS extruded with low- vs. high shear ($P > 0.2$). Overall, ADG was 526, 507, 472, and 493 g/d, ADFI was 784, 741, 682, and 707 g/d, and G:F was 671, 684, 692, and 697 g/kg. Our results indicate that feeding nursery pigs diets with 30% DDGS decreased ADG and ADFI with no effect on G:F. Extruding the DDGS did not ameliorate this loss in performance in nursery pigs.

Key Words: nursery pigs, DDGS, extrusion

676 Belly firmness and bacon quality from finishing pigs fed DDGS with various withdrawal times and with added tallow. M. C. Ulery*¹, G. L. Cromwell¹, G. Rentfrow¹, M. D. Lindemann¹, and M. J. Azain², ¹*University of Kentucky, Lexington,* ²*University of Georgia, Athens.*

An experiment involving 168 pigs (6 reps of 3 or 5 pigs/pen) was conducted to evaluate belly firmness and bacon quality of pigs fed a high level of DDGS followed by varying withdrawal periods before slaughter, and to see if adding a more saturated fat (tallow) to diets containing DDGS would alter belly firmness and bacon quality. Treatments (Trt) were (1) a corn-soy diet or (2) a diet with 45% DDGS fed to term (121 kg) or removed during the final 2, 4, or 6 wk (Trt 3, 4, 5). Trt 6 and 7 were the same as 1 and 2 except 5% tallow was added. Belly flex measures (Abstr. 159, Midwest Section ASAS, 2010) indicated that bellies were softer in pigs fed DDGS, but firmness increased linearly ($P < 0.01$) with increased withdrawal time; tallow addition did not improve firmness. Backfat (inner and outer) and belly fat were analyzed for FA. PUFA (mean of the 3 fat depots) increased when DDGS was fed ($P < 0.01$), and the changes were moderated (linear, $P < 0.01$) with DDGS withdrawal time (Trt 1–5: 12.6, 24.9, 21.6, 18.8, 17.0% of total FA). Iodine values (IV) followed similar trends (62.0, 78.2, 74.1, 69.7, 67.7). Tallow addition had little effect on PUFA (Trt 6–7: 13.4, 23.3%) and IV (66.5, 78.7), particularly in pigs fed DDGS. Bellies from 3 reps were pumped with brine, smoked, and sliced (9 slices/2.54 cm) at a commercial plant. Bacon slices (10/slab) were scored for shatter; fried and scored for distortion, cook loss, and shrink; and evaluated by an 8-member trained sensory panel. DDGS inclusion did not affect bacon yield but it improved shatter scores ($P < 0.01$). Greater distortion, cooking loss, and shrink ($P < 0.05$) occurred in fried bacon from pigs fed DDGS with withdrawal time having no effect. Tenderness and flavor of bacon was not affected by DDGS. Tallow did not consistently affect any of the measures. The results indicate that withdrawal of a high level of DDGS from the finishing diet for 6 wk partially restores belly firmness, but addition of a harder fat does not overcome softer bellies. Except for an improvement in shatter scores and increased cooking loss, most of the other traits and eating quality of bacon were not affected by DDGS.

Key Words: pig, DDGS, bacon

677 Effects of co-products inclusion on growth performance and carcass characteristics of grower-finisher pigs. R. Jha*¹, J. K. Htoo², M. G. Young³, E. Beltranena^{1,4}, and R. T. Zijlstra¹, ¹*University of Alberta, Edmonton, AB, Canada,* ²*Evonik Degussa GmbH, Hanau, Germany,* ³*Gowans Feed Consulting, Wainwright, AB, Canada,* ⁴*Alberta Agriculture and Rural Development, Edmonton, AB, Canada.*

Using co-products (Co-P) while balancing on the basis of NE and standardized ileal digestible (SID) AA provides opportunities to reduce pig feed costs. In a completely randomized design, effects of increasing (from 2.0 to 12.5, 25.0, 37.5 and 50.0%) levels of Co-P (identical ratio of co-extruded flaxseed and field pea, canola meal, wheat/corn

DDGS (1.5:1.0:2.5) on growth performance, carcass quality, and feed cost indices were evaluated. Diet 6 supplemented SID AA 10% above the 37.5% Co-P diet to overcome potential ADFI reductions. In total, 1056 pigs (initial BW 29.5 kg) were fed 1 of 6 isocaloric and iso-lysine dietary regimens in 4 phases (2.40, 2.35, 2.30, and 2.30 Mcal NE/kg and 3.96, 3.62, 3.22, and 2.83 g SID Lys/Mcal NE for d 0 to 19, d 20 to 38, d 39 to 56, and d 57 to 97, respectively) with 22 pigs per pens and 8 pen replicates per regimen. After slaughter at constant BW (118 to 120 kg), carcasses were characterized for all pigs. During the entire 97 d, increasing Co-P did not affect ADFI (2.90 kg), ADG, (1.01 kg) and G:F (0.35). For d 0 to 56, feeding 50% Co-P diet but not at or below 37.5% Co-P inclusions, reduced ($P < 0.05$) ADG and ADFI, however, G:F was not affected. Increasing dietary Co-P levels decreased ($P < 0.05$) dressing percentage and loin depth, but carcass weight was not affected. Increasing Co-P from 2 to 50% decreased ($P < 0.01$) feed cost/unit BW gain by 7%. Supplementing extra 10% SID AA to 37.5% Co-P did not affect performance, increased ($P < 0.01$) carcass lean, but decreased ($P < 0.01$) dressing percentage and backfat compared with 37.5% Co-P diet, indicating that dietary AA supply did not limit BW gain. In conclusion, using feed formulation to balance for identical NE and SID AA content, Co-P can be included up to 50% in grower-finisher pig diets to reduce feed costs without affecting growth performance.

Key Words: carcass quality, co-products, pig

678 Effects of dietary crude protein and inclusion of co-products on growth performance and carcass characteristics of grower-finisher pigs. R. T. Zijlstra^{*1}, R. Jha¹, M. G. Young², J. F. Patience³,

E. Beltranena^{1,4}, and J. K. Htoo⁵, ¹University of Alberta, Edmonton, AB, Canada, ²Gowans Feed Consulting, Wainwright, AB, Canada, ³Iowa State University, Ames, ⁴Alberta Agriculture and Rural Development, Edmonton, AB, Canada, ⁵Evonik Degussa GmbH, Hanau, Germany.

The use of supplemental AA and co-products (Co-P) provide opportunities to reduce feed costs. Co-extruded flax-field pea Co-P may also enhance pork ω -3 fatty acid content, especially α -linolenic acid, and thereby add pork value attributes. In a 2×3 factorial arrangement, effects of 2 levels of dietary CP (N-CP: normal, without restriction) and reduced CP (R-CP: 3%-unit reduction in CP plus supplemental AA), and 3 levels of Co-P (low, without Co-P; medium, 30% Co-P; and high, 40 to 50% Co-P) on growth, carcass, and feed cost indices were explored. In total, 1056 pigs (initial BW 35.4 kg) were fed 1 of 6 isocaloric (2.40 Mcal NE/kg) and iso-lysine (SID Lys:NE (g/Mcal); 4.00, d 0 to 25; 3.63, d 26 to 50; 3.25, d 51 to 71; 2.92, d 72 until end) diet regimens, in pens of 22 pigs for 8 pens per regimen. At slaughter (118 kg BW), the carcass was characterized for all pigs and jowl fat was sampled on 2 pigs per pen. Overall (d 0 to 86), increasing Co-P decreased ($P < 0.001$) ADFI and consequently ADG, and BW at d 86, but did not alter G:F. Decreasing CP did not affect ADG, ADFI, and G:F. Increasing dietary Co-P at the highest level increased ($P < 0.001$) jowl α -linolenic acid by 82%, decreased ($P < 0.001$) carcass weight and backfat, and reduced ($P < 0.001$) feed cost/unit BW gain by 15%. Decreasing CP did not affect jowl α -linolenic acid content, loin depth, and feed costs, but increased ($P < 0.01$) backfat content. In conclusion, increasing dietary Co-P above 30% may reduce growth performance of pigs via reduced ADFI, but will drastically reduce feed costs while enhancing carcass ω -3 fatty acid profile.

Key Words: co-product, omega-3 fatty acid, pig