

Nonruminant Nutrition: Feed Ingredients

T153 Dietary *Aspilia africana* leaf on nutrients digestibility and physio-chemical properties of intestinal segments in quails. O. O. K. Oko,* E. A. Agiang, and I. E. Iso, *University of Calabar, University of Calabar, Calabar, Cross River State, Nigeria.*

The prohibition of most synthetic growth promoters is steering increasing interest in phytobiotics as possible alternatives. Phytobiotics are heterogeneous groups of feed additives originating from fruits, herbs and spices. This study evaluated the effects of *Aspilia africana* leaf (AaL) products on nutrients digestibility and physio-chemical properties of intestinal segments in quails. A total of 420, 1-wk-old quails were assigned to 14 treatments; representing supplementation with 0% (control), 2.5, 5.0, 7.5 or 10% of either meal, aqueous or ethanolic extract of AaL, or 0.02 g/kg terramycin (antibiotic) to a corn and soybean meal based-diet for 42 d (n = 30 chicks per treatment). Each treatment had 3 pens of 10 chicks/pen. On d 36, a digestibility trial involving 12 quails per treatment was initiated. Feed and fecal samples were collected for 4 d and the apparent nutrient digestibility for crude protein, fat, fiber and ash were analyzed. On d 42, quails were euthanized and their intestinal tracts were excised and segmented. The weight, length and density of each segment were measured and 1 mL of digesta was obtained for pH determination. Data were subjected to a 2-way ANOVA. Results indicated that, compared with the control, 5 to 7.5% AaL and antibiotic improved ($P \geq 0.05$) nutrient digestibility in quails; values were higher in quails fed 5 to 7.5% AaL than those on the antibiotic for digestible protein (2.84% v 0.50%), fat (4.82% v 1.42%) and fiber (4.15% v 3.48%). Intestinal length and densities were not affected ($P \geq 0.05$) by dietary treatments. Intestinal weights were reduced ($P \leq 0.05$) by an average of 22.21% and 32.64% in quails fed AaL and terramycin diets, respectively. Also, the pH of contents from the cecum and jejunum were reduced ($P \leq 0.05$) by 0.88 and 0.50 units, respectively, in AaL-fed quails. Comparatively, the aqueous extract exerted higher phyto-genic effects on the physio-chemical properties of the intestinal segments in quails than the meal or ethanolic extract. These findings indicate that dietary supplementation with 5 to 7.5% aqueous extract of *Aspilia africana* leaf could modulate the intestinal characteristics of quails, thus enhancing nutrient digestion.

Key Words: quail, phytobiotics, digestion enhancer

T154 Effects of egg by-product supplementation on the egg production, nutrient digestibility, egg quality, blood profiles, and fecal noxious gas emission in laying hens. L. Yan,* J. P. Wang, and I. H. Kim, *Department of Animal Resource & Science, Dankook University, Cheonan, Choongnam, South Korea.*

A total of 288 42-week-old ISA-brown laying hens were used in a 5-week feeding trial to investigate the effects of egg by-product supplementation on the egg production, nutrient digestibility, egg quality, blood profiles, and fecal noxious gas emission. Hens were randomly allotted into 4 treatments with 12 replications (6 layers per replication) per treatment according to their initial BW. Dietary treatments were: 1) CON (basal diet); 2) EP1 (basal diet + 1% egg by-product); 3) EP2 (basal diet + 2% egg by-product); 4) EP3 (basal diet + 3% egg by-product). Egg by-product used in this trial consisted of 44.01% DM and 15.86% CP (feed basis). All diets were formulated to meet or exceed the NRC (1994) requirements for laying hens. Hens were individually caged and provided with 16 h of light daily. All cages were equipped with nipple drinkers and common trough feeders, experimental feed and water were provided ad libitum throughout the experimental period. The hens were housed in a windowless laying house at approximately 21°C. All statistical

analyses were conducted in accordance with a randomized complete block design, using the GLM procedures of SAS software package (1996). Overall, administration of egg by-product led to a higher ($P < 0.05$) egg production and egg weight compared with the CON group. However, the nutrient digestibility, blood profiles, and fecal noxious gas emission were not affected ($P > 0.05$) by dietary egg by-product supplementation throughout the experimental period. The inclusion of egg by-product increased ($P < 0.05$) yolk height, yolk color, and egg gravity compared with the CON group. Hens fed the egg by-product supplemented diets led to a higher ($P < 0.05$) eggshell thickness and egg shell strength compared with the CON group. No difference was observed ($P > 0.05$) in the haugh unit throughout the experiment. In conclusion, results indicated that egg by-product could be used as a good material in laying hens to improve egg production and egg quality.

Key Words: laying hen, egg by-product, egg quality

T155 Economic evaluation of increasing levels of acerola meal replacing corn in the diet of broilers. V. C. da Cruz*¹, L. H. Zanetti¹, G. do Valle Polycarpo², R. F. de Oliveira¹, A. L. C. Brichi¹, L. C. Carvalho¹, O. J. Sabbag¹, and C. C. do Valle Polycarpo³, ¹São Paulo State University, Dracena Campus, Dracena, São Paulo, Brazil, ²University of São Paulo, Pirassununga Campus, Pirassununga, São Paulo, Brazil, ³São Paulo State University, São José do Rio Preto Campus, São José do Rio Preto, São Paulo, Brazil.

The aim of this study was to evaluate economically the different additions of acerola meal (AM) replacing corn (C) in diets of broilers from 1 to 42-d-old. Nine hundred eighty 1-d-old male Cobb chicks were allotted in a completely randomized design with 4 treatments: T0- basal diet - without addition of AM, T5- addition of 5% AM replacing C, T10- addition of 10% AM replacing C, T15- addition of 15% AM replacing C, and 7 replications with 35 birds per experimental unit. AM addition was performed in relation to the percentage of corn inclusion in diet. The nutritional composition of AM was: 89.15% (DM), 8.36% (CP), 4.57% (EE), 3.19% (MM), 46.27% (CF), 50.86% (NDF), and 41.33% (ADF). An increase in the cost of the rations was observed at levels above 5% inclusion of AM replacing C. Diet with inclusion of 5% of AM showed better cost of feed (US\$912.61) with a value similar to the control diet (US\$913.87). Diets with higher inclusion levels (10 and 15% replacing C) had higher costs (US\$1,008.17 and US\$1,014.46, respectively), probably by the greater inclusion of soybean oil to keep the diets isocaloric. Because it is an ingredient with low-energy (756 kcal/kg AMEn), the AM (US\$ 0.598/kg) used in diets for broilers, must be accompanied by the addition of soybean oil, therefore not causing an effective reduction in the cost per kg of ration. It was observed better value for operating profit, profitability index and final cost/bird for the treatment with 10% inclusion of AM, possibly because this diet provided lower mortality in the experiment; thus, making it more viable economically. The use of AM in diets for broilers can be advantageous in off-season periods, when the price of corn and soybeans are high. The use of alternative ingredients is directly related to the price of traditional feedstock such as corn and soybean meal, as well as the cost of possible supplementation to maintain adequate nutritional levels to animal performance. Thus, the experimental diet with 5% inclusion of AM has lower total cost. However, observing operating profit and profitability index, better values are found in treatment with 10% inclusion of AM.

Key Words: poultry, economic viability, residue byproducts

T156 Effects of egg by-product supplementation on growth performance, nutrient digestibility, blood profiles, relative organ weights, and meat quality in broiler. H. Y. Baek,* Z. F. Zhang, and I. H. Kim, *Department of Animal Resource & Science, Dankook University, Cheonan, Choongnam, South Korea.*

A total of six hundred sixty 1-d-old ROSS 308 broilers (BW = 39.2 ± 0.1 g) were used in a 35-d experiment to evaluate the effect of egg by-product on growth performance, apparent total tract digestibility (ATTD), blood profiles, relative organ weight, and meat quality. Broilers were randomly assigned to 4 dietary treatments with 11 replicate pens per treatment and 15 broilers per pen. Treatments were: 1) CON, basal diet; 2) EP1, CON + 1% egg by-product; 3) EP2, CON + 2% egg by-product, and 4) EP3, CON + 3% egg by-product. During d 1–12, feed conversion rate (FCR) was lower ($P < 0.05$) in EP3 treatment than that in CON treatment, though BWG and FI were not affected ($P > 0.05$) by dietary treatments. During d 12–26, BWG and FCR were improved ($P < 0.05$) in EP3 treatment relative to CON and EP1 treatments. During d 26–36, no differences ($P > 0.05$) were noted in BWG, FI and FCR among treatments. Overall, BWG was higher ($P < 0.05$) in EP3 treatment than that in CON treatment, and FCR was lower ($P < 0.05$) in EP3 treatment than CON, EP1 and EP2 treatments. The ATTD of energy was higher ($P < 0.05$) in EP2 and EP3 treatments compared with CON treatment, but no differences ($P > 0.05$) were noted in the ATTD of DM and N among treatments. The concentration of leukocytes was higher ($P < 0.05$) in EP3 treatment than that in CON and EP2 treatments on d 35 of the experiment. Relative organ weight was not affected ($P > 0.05$) by supplementation of egg by-product. Drip loss was lower ($P < 0.05$) in EP2 and EP3 treatments than that in CON treatment. In conclusion, dietary supplementation with 3% egg by-product may improve growth performance, nutrient digestibility, and increase the concentration of leukocytes in broilers.

Key Words: egg by-product, growth performance, broilers

T157 A survey of free and conjugated deoxynivalenol in European feedstuffs. S.-T. Tran* and T. K. Smith, *Department of Animal and Poultry Science, University of Guelph, Guelph, ON, Canada.*

Deoxynivalenol (DON, vomitoxin), produced by many *Fusarium* species, is one of the most widely distributed mycotoxins globally and is found as a contaminant of cereal grains such as corn, wheat, barley and triticale. Recent studies have described the presence of conjugated forms of DON which are produced by the plant after invasion by the fungus. The aim of the current study was, therefore, to investigate the natural occurrence of free and conjugated DON in European feedstuffs. Free and conjugated DON were determined in 118 feed samples collected in 2011 from Denmark, France, the Netherlands and Russia. Free DON was absent in 26 samples. Levels of free DON ranged from 0.10 to 10.80 µg/g. The highest levels of free DON were found in French samples while Dutch and Russian samples were much less contaminated and French samples contained the highest average free DON concentrations. Conjugated DON was detected in 36%, 38%, 52% and 70% of contaminated samples from Denmark, France, the Netherlands and Russia, respectively. High levels of conjugated DON (>20%) were detected in the majority of Russian samples (17 of 21) and French samples (4 of 12) but no significant differences between concentrations of free DON and total DON content were observed within each country. Samples highly contaminated with DON did not necessarily show a high concentration of conjugated DON. The current survey of free and conjugated DON in European feedstuffs emphasizes the potential challenges in understanding the hazard posed by DON concentration. Although much research has been carried out since the original discovery of free and conjugated

DON, the significance of these mycotoxins for animal health remains to be determined.

Key Words: deoxynivalenol, conjugated, feedstuffs

T158 Effects of sorghum particle size on growth performance and carcass characteristics in finishing pigs. C. B. Paulk,* J. D. Hancock, A. C. Fahrenholz, J. M. Wilson, L. J. McKinney, and K. C. Behnke, *Kansas State University, Manhattan.*

A total of 200 finishing pigs (PIC TR4 × 1050; initially 54 kg) were used in a 69-d growth assay to determine the effects of sorghum particle size on growth performance and carcass characteristics. Pigs were sorted by sex, ancestry, and BW with 5 pigs per pen and 10 pens per treatment. Treatments were a corn-soybean meal-based control with the corn milled to a target particle size of 600 µm and sorghum milled to target particle sizes of 800, 600, and 400 µm. Actual mean particle sizes were 555 µm for corn and 724, 573, and 319 µm for sorghum. Pigs were slaughtered (average final BW of 123 kg) at a commercial abattoir and hot carcass weight (HCW) was used as a covariate for analyses of backfat thickness, loin depth, and percentage fat free lean index (FFLI). Pigs fed the sorghum-based treatments were not different ($P > 0.12$) in growth performance, HCW, backfat thickness, loin depth, or FFLI compared with those fed the corn control; however, there was a tendency for pigs fed sorghum based treatments to have improved ($P < 0.07$) dressing percentage. As particle size of sorghum was reduced from 724 to 319 µm, ADG was not affected ($P > 0.39$) but G:F increased (linear effect, $P < 0.01$). Reducing particle size of sorghum had no effect ($P > 0.15$) on HCW, backfat thickness, loin depth, or FFLI, but dressing percentage tended to improve ($P < 0.06$). Regression analysis indicated that sorghum ground to 515 µm supported G:F equal to that of corn ground to 555 µm. In conclusion, linear improvements in G:F were demonstrated with reduction of sorghum particle size from 724 to 319 µm. Moreover, our data suggest that when ground 50 µm finer than corn, sorghum-based diets will support growth performance and carcass measurements equal to corn-based diets.

Table 1.

Item	Corn,	Sorghum,	Sorghum,	Sorghum,	SE
	555 µm	724 µm	573 µm	319 µm	
ADG, g	1,078	1,128	1,103	1,100	23
ADFI, kg	2.90	3.10	2.99	2.91	0.07
G:F, g/kg	372	365	369	379	4
HCW, kg	88.1	90.6	89.7	90.0	1.8
Dress, %	72.5	72.7	73.0	73.2	0.2
Backfat thickness, mm	22.7	22.1	22.1	22.4	0.9
Loin depth, mm	59.7	60.9	59.9	59.4	0.9
FFLI, %	49.2	49.7	49.5	49.3	0.6

Key Words: sorghum, particle size, finishing pigs

T159 Chemical composition of canola meal, 00-rapeseed meal, and 00-rapeseed expellers. T. Maison* and H. H. Stein, *University of Illinois, Urbana.*

The objective of this work was to compare the chemical composition of canola meal, 00-rapeseed meal, and 00-rapeseed expellers. Eleven samples of canola meal were collected from crushing plants in North America, and 10 samples of 00-rapeseed meal and 5 samples of 00-rapeseed expellers were collected from crushing plants in Europe. All samples were analyzed for GE, DM, CP, AA, ash, acid hydrolyzed

ether extract (AEE), crude fiber, ADF, NDF, ADL, glucose, fructose, maltose, sucrose, raffinose, stachyose, verbascose, starch, Ca, K, Mg, Na, P, S, Co, Cr, Cu, Fe, Mn, Mo, Se, Zn, phytic acid, and glucosinolates. Concentrations of these components in canola meals were compared with those in 00-rapeseed meals, and 00-rapeseed meals were compared with 00-rapeseed expellers. Results indicated that concentrations of sucrose, P, K, Zn, and glucosinolates are greater ($P < 0.05$) in 00-rapeseed meal than in canola meal. Concentrations of GE and AEE are greater ($P < 0.05$) in 00-rapeseed expellers than in 00-rapeseed meal, but concentrations of CP, Thr, ash, sucrose, crude fiber, NDF, ADL, Ca, K, Mg, P, S, and Mo, are greater ($P < 0.05$) in 00-rapeseed meal than in 00-rapeseed expellers. For canola meal, concentrations of CP, Ca, Fe, and Mn are greater than values published by NRC (1998), but concentrations of most other nutrients in canola meal are in good agreement with NRC (1998) values. In conclusion, the concentration of glucosinolates is much less in canola meal than in 00-rapeseed meal, and concentrations of AEE and GE are greater in 00-rapeseed expellers than in 00-rapeseed meal. However, concentrations of most other nutrients are greater in 00-rapeseed meal than in 00-rapeseed expellers.

Table 1. Composition of canola meal (CM), 00-rapeseed meal (RSM), and 00 rapeseed expellers (RSE), DM-basis

Item	CM	RSM	RSE
GE, ¹ kcal/kg	4,708	4,734	5,143
CP, ² %	41.4	40.7	38.8
Fat, ¹ %	4.3	4.1	12.6
NDF, ² %	33.6	33.8	27.0
Ash, ² %	7.9	7.8	6.8
Glucosinolates ³ , $\mu\text{mol/g}$	3.6	11.3	14.5

¹00-rapeseed expellers greater than 00-rapeseed meal ($P < 0.05$).

²00-rapeseed meal greater than 00-rapeseed expellers ($P < 0.05$).

³Canola meal greater than 00-rapeseed meal ($P < 0.05$).

Key Words: canola meal, composition, rapeseed meal

T160 Comparison of growth performance of pigs fed cull chickpeas high in fiber. J. M. Uriarte,* J. F. Obregon, H. R. Güemez, J. A. Romo, J. M. Romo, and A. Leon, *Universidad Autonoma de Sinaloa*.

The objective of this experiment was to determine the effect of substituting high-fiber (11.3% crude fiber, CF) cull chickpeas for soybean meal and corn on growth performance in pigs. Forty-eight pigs (BW = 32.158 ± 1.148 kg; Large White \times Landrace \times Large White \times Pietrain) in groups of 4 were placed in 12 concrete floor pens (1.5 \times 6 m). In a complete randomized experimental design, pigs received one of 3 diets: 1) diet with 17.8% CP, 3.27 Mcal of ME/kg, 0.99% Lys and CF 3.47%; containing 71.5% corn, 26% soybean meal and 2.5% premix (CONT); 2) diet with 17.8% CP and 3.23 Mcal of ME/kg, 1.01% Lys, 5.95% CF, with 47.2% corn, 35% cull chickpeas, 13% soybean meal, 2.3% vegetable oil and 2.5% premix (CHP35), and 3) diet with 17.5% CP and 3.20 Mcal of ME/kg, 1.03% Lys, 8.42% CF, with 22.5% corn, 70% cull chickpeas, 5.0% vegetable oil and 2.5% premix (CHP70). Pigs were weighed at d 0 and 42 of the experiment and feed intake was recorded daily. Average daily gain and feed intake/gain ratio were calculated from these data. Body weight at d 42 was reduced ($P = 0.01$) in pigs fed diets containing cull chickpeas, being 69.8, 58.5 and 47.1 kg for CONT, CHP35 and CHP70, respectively. Average daily gain (0.837 CONT, 0.623 CHP35, and 0.358 kg CHP70) was also reduced ($P = 0.01$) by treatments containing cull chickpeas. Feed intake (2.088, 1.656 and 1.154 kg) was reduced in pigs fed cull chickpeas ($P = 0.01$). Feed/gain ratios (2.687, 2.663 and 3.289) were similar ($P = 0.16$) across treatments.

Thus, we concluded that high-fiber cull chickpeas fed at 35% or more of the diet negatively affects growth performance of growing pigs.

Key Words: chickpeas, growth performance, pigs

T161 Standardized ileal digestibility of Illinois bundleflower, low-oligosaccharide soybean meal and conventional soybean meal. J. A. Jendza* and S. K. Baidoo, *University of Minnesota, Waseca*.

Twenty-four growing pigs were fitted with ileal T-cannula, housed in individual metabolism crates, and used to determine the standardized ileal digestibility (SID) of low-oligosaccharide soybean meal (LOSBM), conventional soybean meal (SBM) and Illinois bundleflower (IBF). The lower fiber content of LOSBM results in higher analyzed concentration of CP and amino acid when compared with SBM. The reduced fiber content in LOSBM was also expected to improve SID of protein and amino acids as compared with SBM. Illinois bundleflower is a relatively novel, high-protein feedstuff for which little nutritional data are available. Treatments consisted of 3 diets formulated to supply all protein from a single source and a fourth N-free diet made primarily from cornstarch and sucrose. Diet 1 contained 33.6% IBF, and supplied 12% CP and 3,600 kcal/kg of DE. Diet 2 contained 25.3% SBM, and supplied 12% CP and 3,725 kcal/kg of DE. Diet 3 contained 22.6% LOSBM, and supplied 12% CP and 3,770 kcal/kg of DE. Diet 4 contained no source of protein, supplied 3,791 kcal/kg of DE, and was used to calculate basal endogenous losses. Digestibility results were compared across treatments using a multiple comparison test, the Tukey adjustment, and with $\alpha = 0.05$. Generally, SID of amino acids were numerically greater for LOSBM than SBM (between 0.54 to 12.13 percentage points higher), but the differences were not significant. On the other hand, the SID of most amino acids in IBF were 20 to 40 percentage points lower than that of SBM ($P < 0.05$). The SID of lysine, methionine, and threonine for SBM were 91.9, 87.8, and 83.2%, respectively. The SID of lysine, methionine, and threonine for LOSBM were 92.4, 88.8, and 86.2%, respectively. The SID of lysine, methionine and threonine for IBF were 73.3, 58.1, and 49.2%, respectively. In conclusion, LOSBM is at least as good a source of SID amino acids as SBM, but the protein value of IBF is much lower.

Key Words: swine, standardized digestibility, ileal cannula

T162 Resistant starch content of cereal grains common utilized for pig nutrition. G. Giuberti, A. Gallo, M. Rzepus, M. Moschini, and F. Masoero,* *Università Cattolica del Sacro Cuore, Piacenza, Italy*.

Resistant starch (RS) has been defined as the portion of starch that is not hydrolyzed by the enzymes in the small intestine. Therefore it passes to the large bowel, where can be principally fermented to short-chain fatty acids. In pigs, diets containing starch with a high level of RS were associated with a greater digesta mass that may benefit the diversity and population of gut bacteria and may improve the production of short-chain fatty acids, including butyrate. However, high-RS diets may affect digestion of nutrient, were associated with a lower in vivo starch digestibility and feed efficiency and can exacerbate the expression of swine dysentery. Currently, limited information is available about the RS content of single cereal grains commonly employed in pig nutrition. Consequently a set of 42 raw samples (6 maize, 6 dehulled barley, 6 triticale, 6 rice, 6 high moisture corn or HMC, 6 wheat and 6 sorghum) randomly collected from international feed companies was evaluated for the RS content with a 2-steps in vitro method simulating gastric and pancreatic phases. Following Englyst classification of starch fractions, RS was measured considering the starch not hydrolyzed after 120 min of enzymatic incubation. Data were subject to one-way ANOVA and

significance were declared at $P < 0.05$. Minimum significant difference (MSD) was generated from Tukey's test and was used as the basis of the multiple comparisons among means. Cereals were characterized by a wide range of RS content ($P < 0.05$) and the MSD was 53 g/kg DM. In particular, sorghum had the highest RS content (262 ± 31 g/kg DM; $P < 0.05$), whereas wheat the lowest (53 ± 27 g/kg DM; $P < 0.05$). Intermediate RS values were recorded for dehulled barley (133 ± 31 g/kg DM), triticale (138 ± 40 g/kg DM), HMC (142 ± 25 g/kg DM), rice (165 ± 29 g/kg DM) and corn (191 ± 22 g/kg DM) samples. A proper evaluation of the RS content of cereal grains could be important for a complete feed evaluation. However, more research is warranted to increase knowledge about the role of RS on metabolic and productive responses in pigs.

Key Words: resistant starch, in vitro method, pig

T163 Effects of molasses supplementation on the growth performance, nutrient digestibility, blood characteristics, fecal moisture, and fecal noxious gas emission in growing pigs. J. Li^{*1}, X. Y. Guo¹, D. S. Nam², and I. H. Kim¹, ¹Department of Animal Resource & Science, Dankook University, Cheonan, Choongnam, South Korea, ²Nonghyup Feed Co. Ltd., Seoul, South Korea.

A total of 120 growing pigs [(Landrace \times Yorkshire) \times Duroc, BW = 22.81 ± 1.21 kg] were used in a 5-week feeding trial to evaluate the effects of dietary administration of molasses on growth performance, apparent total tract digestibility (ATTD), blood characteristics, fecal moisture, and fecal noxious gas emission. Pigs were randomly distributed into 1 of 3 dietary treatments on the basis of BW. Each treatment had 10 replicate pens with 4 pigs per pen. Dietary treatments were: CON, basal diet; T1, CON + 2.5% molasses; T2, CON + 5.0% molasses. The cane molasses used in this trial contained 4.12% CP and 9.234 MJ/kg ME (feed basis). All diets were formulated to meet or exceed the NRC requirements for growing pigs. All pigs were housed in an environmentally controlled room with a full slatted plastic floor. Each pen was equipped with a one-sided, stainless steel self-feeder and a nipple drinker, pigs were allowed ad libitum access to feed and water. No differences ($P > 0.05$) were observed in ADG, ADFI, or G:F among dietary treatments. There were no differences ($P > 0.05$) in the ATTD of DM, N, and energy among dietary treatments. No effects ($P > 0.05$) were observed on the concentrations of RBC, WBC, and lymphocyte percentage. The fecal moisture was not affected ($P > 0.05$) by the supplementation of molasses. The fecal acetic acid emission in T2 treatment was lower ($P < 0.05$) than that in CON treatment on d 3, 5 and 7, but no difference ($P > 0.05$) was observed in the ammonia (NH₃) emission among treatments. This study indicated that the supplementation with 5% molasses in growing pig diets reduced the fecal acetic acid emission, without negative effects on the growth performance of growing pigs.

Key Words: growing pigs, growth performance, molasses

T164 Effects of fermented corn by *Bacillus subtilis* on the growth performance, nutrient digestibility, fecal microbial shedding, and fecal noxious gas emission in growing pigs. J. H. Jung^{*}, H. Y. Baek, and I. H. Kim, Department of Animal Resource & Science, Dankook University, Cheonan, Choongnam, South Korea.

A total of 160 growing pigs [(Landrace \times Yorkshire) \times Duroc, BW = 27.3 ± 0.47 kg] were used in a 6-week growth experiment to investigate the effects of fermented corn by *Bacillus subtilis* on growth performance, nutrient digestibility, fecal microbial shedding, and fecal noxious gas

emission. Pigs were allotted to 1 of 5 dietary treatments (8 replicate pens per treatment with 4 pigs per pen) based on their initial BW using a randomized complete block design. All the pigs were housed in an environmentally controlled room with a slatted plastic floor. Each pen was equipped with a 1-sided self-feeder and a nipple drinker, pigs were allowed ad libitum access to feed and water throughout the experimental period. Dietary treatments were: 1) CON (basal diet); 2) FC3, CON + 3% fermented corn; 3) FC6, CON + 6% fermented corn; 4) FC9, CON + 9% fermented corn; 5) FC12, CON + 12% fermented corn. Common corn was fermented by *Bacillus subtilis* 2-19cx for 48 h (35–40°C). The counts of *Bacillus subtilis* in fermented corn are 10^9 cfu/gram. An adjustment period with same corn-soybean meal was provided 3 d before the experiment. Pigs fed the FC6 and FC9 diets led to a greater ($P < 0.05$) ADG than those fed the CON and FC3 diets. FC6 treatment significantly increased ($P < 0.05$) G:F compared with CON treatment. No difference ($P > 0.05$) was observed in the nutrient digestibility throughout the experiment. The inclusion of fermented corn did not affect ($P > 0.05$) the fecal *Lactobacillus* and *E. coli* population. No difference was noted in fecal ammonia, H₂S, total mercaptans, and acetic acid emission. In conclusion, fermented corn could be used as a good feed material for growing pigs, with its optimal supplementation level at 6%. The inclusion of fermented corn did not affect the fecal microbial shedding, and fecal noxious gas emission in the current study.

Key Words: *Bacillus subtilis*, fermented corn, growing pig

T165 Apparent dry matter digestibility and nitrogen balance in pigs fed high fiber diets. A. Woldeghebriel^{*}, S. Smith, T. Barrios, and B. Pope, North Carolina A&T State University, Greensboro.

The current study was conducted to investigate the effects of feeding high fiber diet on apparent total tract dry matter digestibility and nitrogen balance in growing pigs. Sixteen barrows averaging 16.4 kg were randomly assigned to 1 of 4 diets after metabolic crate assignments with individual pig serving as experimental unit. Diets included a corn-soybean meal basal diet as the control (CON), and 3 antibiotic-free, high-fiber diets (D1, D2 and D3) each containing 5% sugar beet pulp plus one of the following: 1:2, 1:1, and 2:1 oat to barley ratios. Diets were formulated to contain similar amounts of protein (18% CP) and energy (3.415 Mcal DE/kg) and were supplemented with minerals and vitamins to meet NRC nutrient recommendations. However, the fiber content of the CON diet was much lower than the average of the 3 high-fiber diets (8.38% vs. 22.40% NDF). Pigs had free access to water, but feed allowance was limited to 10% of average initial body weight and fed twice daily. The study period was divided into a 10 d adjustment period and a 5 d collection of urine and feces. Data were analyzed using SAS procedures where animals were considered random effects, and diet means were used to compare treatment effects. Results of the study indicated that DM and N intakes in pigs fed D2 and D3 were higher ($P < 0.05$) than CON or D1-fed pigs. However, there was no significant difference in DM and N intakes between D2 and D3, or between CON and D1-fed pigs. The lowest ($P < 0.05$) apparent dry matter digestibility coefficient determined was for D1-fed pigs, with no significant differences among the rest of the treatment groups. The averages for total and fecal N losses in pigs fed high-fiber diets were higher ($P < 0.05$) than CON-fed pigs. Relatively higher fecal and lower urinary N losses were observed as oat to barley ratios increased, but differences observed were not statistically significant. It seems therefore, N-excretion had shifted from urine to feces indicating that microbial mass in feces increases as the amount of fiber in the diet increases.

Key Words: dietary fiber, oats, nitrogen loss