

$r=0.331$  respectively), indicating that samples with less intact desmin may have lower WBS values. The pH at 24 h and intact SERCA-1 at 96 h and 7 d in the LD were significantly correlated ( $r=0.276$  and  $r=0.306$  respectively) and in the SM at 96 h and 7 d ( $r=0.326$  and  $r=0.382$  respectively) indicating that samples with low 24 h pH had less intact SERCA-1 at later aging times. These results indicate increased prote-

olysis of SERCA-1, RYR, and desmin may be associated with increased tenderness. These results also indicate that SERCA-1 degradation may be associated with differences in pH decline.

**Key Words:** Tenderness, Pork, Proteolysis

## Nonruminant Nutrition: Feed ingredients

**296 Influence of variation in particle size on the flow characteristics of ground corn.** C. N. Groesbeck\*, R. D. Goodband, M. D. Tokach, J. L. Nelssen, S. S. Dritz, C. W. Hastad, and K. R. Lawrence, *Kansas State University, Manhattan.*

In previous research, we showed that roller mill (RM) ground corn flows better than corn ground with a hammer mill (HM), and decreasing particle size and increasing fat decreases flow ability. Therefore the objective of these experiments was to determine if the flow differences between HM and RM ground corn were due to the particle size standard deviation (PSSD). In both Exp., RM and HM corn samples were sifted through 13 screens and material from each screen was collected. Samples were dried 12 h to equalize moisture content. Soy oil was then added at 0, 4, and 8 % to samples. Flow ability was then determined by measuring angle of repose (the maximum angle measured in degrees at which a pile of grain retains its slope). A large angle of repose represents a steeper slope and poorer flow ability. In Exp. 1, we created 5 RM samples with mean particle size ranging from 1415 to 343 microns and 5 HM samples from 1382 to 333 microns. All samples were created to have similar PSSD, ranging from 1.1 to 1.3. There was an interaction ( $P<0.05$ ) between particle size, added fat, and mill type. Increasing fat increased angle of repose; however, the difference was less in fine ground HM samples than in the RM samples. In RM samples, decreasing particle size had less of an impact on flow ability than in HM ground corn. In Exp. 2, we used 4 RM and 4 HM samples that were constructed from the previously collected grain. All samples were similar in mean particle size (641 to 679 microns) with varying PSSD (1.62 to 2.27). There was no ( $P>0.10$ ) fat  $\times$  PSSD  $\times$  mill type interaction observed. Increasing fat ( $P<0.04$ ) and PSSD ( $P<0.001$ ) decreased flow ability. These data suggest that the greater flow ability of RM ground corn appears to be a result of less particle size variation. However, with fine particle sizes ( $<700$  microns) other factors, such as particle shape, may also contribute to flow ability.

**Key Words:** Particle size, Hammer mill, Roller mill

**297 Effects of soybean meal source and level on growth performance of weanling pigs.** K. R. Lawrence\*, R. D. Goodband, M. D. Tokach, S. S. Dritz, J. L. Nelssen, J. M. DeRouche, C. W. Hastad, B. W. James, and M. G. Young, *Kansas State University, Manhattan.*

Three experiments were conducted to compare the effects of increasing solvent extracted soybean meal (SBM) and extruded-expelled soybean meal (EESoy) in diets for early-weaned pigs. All pigs (PIC; 5 pigs/pen) were fed a control diet containing no SBM or diets containing 20% or 40% of either SBM or EESoy. In Exp. 1 ( $n=175$ , 6.0 kg BW; 7 pens/treatment), diets were formulated using NRC (1998) nutrient values for SBM and previously determined values for EESoy. From d 0 to 14, no differences were observed in ADG or ADFI ( $P>0.05$ ), but G:F became poorer (linear,  $P<0.06$ ) with increasing soybean meal source. Soybean meal sources were analyzed for CP after the trial was completed. We speculated numeric differences in performance between sources could have been a result of lower than expected CP in the EESoy. In Exp. 2 ( $n=350$ , 5.9 kg BW; 14 pens/treatment), soybean meal sources were analyzed and actual nutrient values were used in diet formulation. From d 0 to 14, increasing SBM decreased ADFI (linear,  $P<0.02$ ). Increasing EESoy decreased ADG, ADFI, and G:F (linear,  $P<0.01$ ). Soybean meal sources used in Exp. 1 and 2 were then analyzed for trypsin inhibitor (TI). The EESoy from Exp. 1 and 2 had TI values greater than 6 mg TI/g, suggesting it was underprocessed, while SBM had values less than 2 mg TI/g. In Exp. 3 ( $n=350$ , 7.1 kg BW; 14 pens/treatment), different lots of EESoy and SBM were analyzed for TI (EESoy=1.8 mg TI/g; SBM=0.7 mg TI/g) to ensure quality and actual CP values were used in diet formulation. From d 0 to 14, increasing EESoy decreased ADG and ADFI, but improved G:F (linear,  $P<0.01$ ). Increasing SBM decreased ADFI, but improved G:F (linear,  $P<0.02$ ). No differences ( $P>0.05$ ) were found between soybean meal sources. Feeding 40%

EESoy or SBM in diets immediately after weaning resulted in poorer growth performance of weanling pigs compared to those fed lower levels (20%). Feeding properly processed EESoy resulted in similar growth performance compared to feeding SBM.

**Key Words:** Pigs, Soybean meal, Performance

**298 Effect of Poultry by-product meal on pig performance.** J. R. Orozco-Hernandez\*, J. J. Uribe, S. G. Bravo, V. O. Fuentes-Hernandez, A. Aguilar, and O. H. Navarro, *Centro Universitario de los Altos, Universidad de Guadalajara, Tepatitlan, Jalisco, Mexico.*

Searching and assessing proteinaceous ingredients to be used in single stomach animals is a constant task. On the other hand, there is a continuous renewal of poultry population which generates a protein source of amino acids that can be used in pig feeding. The objective of the trial was to assess increasing levels of a poultry by-product meal in practical pig feeding, from weaning to market weight. Forty newly weaned hybrid pigs were separated into 5 animal groups to assess the addition of 0, 2.5, 5 y 7.5% (dry matter basis) of a poultry by-product meal (HSA) to a sorghum-soybean meal diet in pigs. The intake was measured daily and the weight gain was calculated using initial and final measurements. The initial weight was used as co-variable for the gain. Most of the production parameters were negatively affected with the addition of HSA ( $P < 0.05$ ). Carcass yield and fat content were reduced ( $P < 0.05$ ), however the yield of mexican style cuts varied differently. In conclusion, increasing the addition of HSA affects negatively some of the production parameters and carcass yield in pigs.

**Key Words:** Poultry by-product, Pig, Feeding

**299 Effect of inulin and sugar beet pulp on the growth performance and carcass characteristics of wean to finish pigs.** G. F. He\*, S. K. Baidoo, Q. Yang, and R. D. Walker, *Southern Research and Outreach Center, University of Minnesota, Waseca, MN 56093.*

The objective of the present study was to determine the performance and carcass characteristics of wean-to-finish pigs fed diets with different carbohydrate sources (inulin and sugar beet pulp). Six hundred and forty early weaned (17-d old,  $5.7 \pm 0.11$ kg body weight) barrows and gilts were housed in an environmentally controlled facility from wean to finish. The duration of the study was divided into five phases: 5.7-10; 10-20; 20-50; 50-90; 90-115kg BW. Pigs were blocked by initial body weight and allotted to four dietary treatments: (1) corn soybean meal basal diet as control; (2) basal diet supplemented with inulin in water, 132g/L in phase 1-2, 66g/L in phase 3-5; (3) Ground sugar beet pulp (5% and 7% in phase 1 and 2, 9% in phase 3-5) replacing partial corn in control diet; (4) basal diet supplemented with 0.25% antibiotics (ASP250, Roche Vitamins Inc., Basel, Switzerland) only in phase 1-3. Pigs in treatment 4 grew faster ( $P<0.01$ , 601, 613, 594 and 666 g/day for treatment 1-4, respectively,  $s.e.=8.10$ ) and had higher feed intake ( $P<0.01$ , 1244, 1276, 1273, 1368 g/day for treatment 1-4, respectively,  $s.e.=18.30$ ) than others in phase 1-3. Gain to Feed was negatively influenced ( $P<0.01$ ) by sugar beet pulp supplementation in treatment 3 compared to treatments 1, 2 and 4 (0.48, 0.48, 0.46, 0.49 for treatment 1, 2, 3 and 4, respectively,  $s.e.=0.004$ ) in phase 1-3. In phase 4, increased growth rate was observed in pigs supplemented with inulin in water ( $P<0.01$ , 1021, 1054, 1026, 1002 g/day for treatment 1-4, respectively,  $s.e.=9.79$ ). In phase 5, there was no difference in growth performance among treatment groups. Post-slaughter carcass characteristics, including average fat depth, average loin depth, lean percentage and carcass grade premium, were not influenced by the treatments except dressing percentage, which was lower for treatment 3 group ( $P=0.02$ , 74.4%, 74.4%, 73.4% and 74.6% for treatment 1, 2, 3 and 4, respectively,  $s.e.=0.29$ ). In conclusion, continuous supplementation of inulin

in water improved pig performance in late but not early growth stage. Dressing percentage was reduced by sugar beet pulp supplementation in wean-to-finish diets.

**Key Words:** Wean -to - finish pigs, Inulin, Sugar beet pulp

**300 Effect of ractopamine on the performance and carcass characteristics in finishing pigs.** G. He\*, S. K. Baidoo, Q. M. Yang, and R. D. Walker, *Southern Research and Outreach Center, University of Minnesota, Waseca.*

This study was designed to evaluate the effect of ractopamine on finishing pigs fed two levels of total lysine (0.81% vs. 1.11%) with and without ractopamine (0 vs. 10 ppm) in a two-way factorial arrangement. Three hundred and twenty crossbred barrows and gilts with body weight of 971.12 kg housed in an environmentally controlled facility were blocked and randomly allotted to the four dietary treatments. Pigs' weight and feed intake were recorded weekly until the average of the pen reached 115-kg body weight. Ractopamine significantly promoted growth rate (965 vs. 1110 g/day, S.E. =23.3, P<0.01) and improved Gain: Feed ratio (0.28 vs. 0.33, S.E. =0.0067, P<0.01). The improvement in growth rate by ractopamine was 133% higher at high lysine level than low lysine level. In addition, the improvement by ractopamine on growth rate decreased with time (1158 vs. 1441 g/day in week 1, 946 vs 1050 g/day in week 2 and 791 vs 839 g/day in week 3, S.E. =40.3, P=0.014). Average backfat depth was reduced by ractopamine supplementation only when high lysine diet was fed (0.76 vs 0.79 cm at 0.81% lysine and 0.80 vs 0.70 at 1.11% lysine, S.E. =0.025, P<0.01). Average loin depth was significantly increased by the addition of ractopamine (2.79 vs 2.90 cm, S.E. =0.021, P<0.01). Increased lean muscle percentage by ractopamine was only observed in high lysine group (55.2% vs 55.4% at 0.81% lysine and 55.1% vs 56.3% at 1.11% lysine, s.e. =0.22, P=0.026), whereas dressing percentage was significantly increased by ractopamine only in low lysine group (73.7% vs 75.6% at 0.81% lysine and 74.2% vs 74.6% at 1.11% lysine, s.e. =0.31, P=0.021). In conclusion, ractopamine improved growth

performance and carcass characteristics in pigs fed the high lysine diet and increased dressing percentage in finishing pigs fed low lysine diet.

**Key Words:** Finishing pigs, Ractopamine, Carcass characteristics

**301 Comparison of grain sources (barley, white corn, and yellow corn) for swine diets and their effect on fatty acid composition and fat quality.** J. F. Lampe\*, T. J. Baas, and J. W. Mabry, *Iowa State University.*

An experiment was conducted to evaluate the effect of energy source on fatty acid characteristics and fat quality of the longissimus muscle of pigs. Diet treatments (primary energy sources) were: 1) yellow corn, 2) white corn, 3) 1/3 yellow corn, 2/3 white corn, 4) 2/3 yellow corn, 1/3 white corn, and 5) barley. Pigs were from two genetic sire lines, Duroc and Hamp x Duroc sires (HD) on PIC 1055 females. A total of 999 pigs were included in the trial in a 2 x 2 x 5 factorial arrangement with two genetic types, two sexes (barrows and gilts) and five dietary treatments. Eight pigs were randomly selected from each pen (n= 319) for meat, eating quality, and fatty acid evaluation. Pigs were placed on test at 27.6 kg and fed to 130.2 kg. In a four-phase diet regimen, the final two phases of the finishing diets (67.2 to 130.2 kg) included 1% supplemented choice white grease. All animals were held overnight at a commercial abattoir before harvest. One whole skin-on, boneless loin was collected from each carcass and held at -1 degree Celsius in a vacuum-sealed bag at the Iowa State University Meat Lab. At 25 to 27 days post-harvest, loins were analyzed for meat and eating quality and samples were collected from the 10<sup>th</sup> rib for fatty acid analysis. Fatty acid composition was determined by standard gas chromatographic procedures. Pigs were given an individual subjective fat color score. Pigs fed diet 5 had a lower (P < 0.05) iodine value than pigs fed all other diets. Dietary treatments had no effect on (P > 0.05) subjective fat color scores. Pigs fed diet 5 had higher (P < 0.05) saturated and monounsaturated fatty acids than pigs fed all other diets. Results suggest that different energy sources evaluated in this study do not have an effect on subjective fat color but do have an effect on fat firmness.

**Key Words:** Pigs, Fatty acid composition, Energy sources

## Production, Management, and the Environment

**302 Effect of scraping frequency in a free stall barn on volatile N loss from dairy manure during summer.** V. R. Moreira\*<sup>2</sup> and L. D. Satter<sup>1,2</sup>, <sup>1</sup>*U.S. Dairy Forage Research Center, Madison, USDA - Agricultural Research Service,* <sup>2</sup>*Department of Dairy Science, University of Wisconsin - Madison.*

The difference between estimated nitrogen:phosphorus ratio (N:P) of fresh excreta and measured N:P in scraped manure was used to estimate N loss when manure was scraped 2x (0800 and 1900h) or 6x (0900, 1200, 1500, 1800, 2300, and 0400h) daily, during each of two 24h-periods in late August. Mid-lactation cows (n=137), milking 31.6 kg/cow/d, were distributed among 4 pens for an ongoing feeding trial with diets containing two levels of P (.38 and .55% of DM) and similar CP (19.3% of DM). Each pen had a back (stall) and a front (feedbunk) alley from which manure was scraped and sampled separately. The NRC (2001) model was used to estimate dry matter intake. Excretion of N and P was calculated as kg of ingested nutrients minus the amount of nutrients secreted in milk. Volatile N loss as a percent of excreted N was estimated as:  $1 - (\text{manure N:P} \div \text{excreta N:P})$ . Average air temperature outside the barn throughout the sampling period was 18°C (max=27°C and min=11°C). Statistical analysis was performed as Repeated Measures within alley using a first order autoregressive covariate structure (Mixed Procedures - SAS 8.0). It was expected that frequent manure removal from the barn floor would result in lower N volatilization by reducing the time of manure exposure. This was not observed. Frequent scraping could have an offsetting effect by enhancing volatile N loss through spreading urine over a larger floor area. Volatile N loss was estimated to range between 37.5 and 43.1% of excreted N.

	Scraping frequency (Freq)				SEM	Effects (P≤)		
	2x	2x	6x	6x		Freq	Alley	Day *Freq
Manure analyses	Front alley	Back alley	Front alley	Back alley				
pH	7.73	8.15	7.84	8.04	0.14	1.00	0.01	0.43
Temp., °C	21.7	23.2	22.0	22.3	0.52	0.48	0.29	0.23
Dry								
i matter, %	10.7	11.6	11.4	11.9	0.48	0.26	0.01	0.71
N, %DM	4.09	4.04	3.86	3.86	0.10	0.03	0.75	0.32
Ash, %DM	16.5	17.9	16.1	16.7	0.51	0.11	0.01	0.05
P, %DM	0.95	0.93	0.96	0.95	0.04	0.67	0.54	0.05
N:P	4.44	4.62	4.16	4.19	0.17	0.03	0.36	0.04

**Key Words:** Dairy manure, Ammonia, Nitrogen

**303 The effect of dietary calcium and phosphorus on water extractable phosphorus in feces of dairy cows.** J. D. Ferguson<sup>1</sup>, S. R. Michelone\*<sup>1</sup>, C. F. Ramberg, Jr.<sup>1</sup>, and Z. Dou, <sup>1</sup>*University of Pennsylvania, School of Veterinary Medicine.*

Four TMR rations varying in Ca and P content were fed to two groups of mid-late lactation cows (15/ per group) to examine the effect on water extractable phosphorus in feed and feces. The study was a Latin Square design with three, four week periods with diet switches between groups every two weeks. The rations had the following Ca, P content (%DM basis): Con: Ca .69, P .38; HighCa: Ca 1.2, P .38; HighCa<sub>P</sub>: Ca 1.2, P .60; HighP: Ca .69, P .60. On three consecutive days of the second week of each dietary block, daily samples of feed and feces were collected for analysis of DM, Ca and P. Fecal samples were collected from each cow, mixed thoroughly, and composited daily by group. Wet samples of feces (2 g, approximately .3 g of DM) and dried, ground samples of TMR