but initial feed intake may be depressed during Phase II when DDGS is fed to pigs weaned at younger ages (17 d of age or less).

Key Words: Distiller's Dried Grains with Solubles, Swine, Nursery

216 Feed intake and energy digestibility among wheat classes fed to weaned pigs. R.T. Zijlstra*[1], D. Overend[2], D. R. Hickling[3], P. H. Simmins[4], and J. F. Patience[1], [1]*Prairie Swine Centre Inc., Saskatoon, SK,* [2]*Ridley Inc., Mankato, MN,* [3]*Canadian International Grains Institute, Winnipeg, MB,* [4]*Danisco Animal Nutrition, Marlborough, UK.*

The nutritional quality of wheat is expected to vary among classes; therefore, Soft and Durum wheat are separated. A range in wheat CP and non-starch polysaccharide (NSP) partly causes the variation in quality. Two cultivars from each of six classes (Soft White, Soft Red, Durum, Hard Red Spring (HRS), Hard Red Winter (HRW) and Hard White (HW)) were collected. Crude protein (as-is) ranged from 12.2 to 17.4% for all, 12.4 to 16.1% for Soft, and 16.3 to 16.8% for Durum. Total NSP ranged from 9.0 to 11.5% for all, 11.0 to 11.4% for Soft, and 9.0 to 10.1% for Durum. A 3-wk growth and digestibility study was conducted with 12-kg weaned pigs (PIC; 39-d-old; 4 pigs/pen, 12 pens per cultivar) fed 65%-wheat diets (3.5 Mcal DE/kg; 3.4 g digestible Lys/Mcal). For d 0 to 21, ADG, ADFI, and feed efficiency did not differ among wheat classes ($P > 0.10$). For d 0 to 7, ADG for Durum was 9% lower than for HRW ($P < 0.05$), and similar among other classes. For d 8 to 14, ADG did not differ among classes ($P > 0.10$). For d 0 to 7, ADFI for HW was 7% lower than for HRW ($P < 0.05$), and similar among other classes. For d 8 to 14, ADFI for Soft White was 5% lower than for HRS ($P < 0.05$), and similar among other classes. For d 0 to 7, feed efficiency was 4% lower for Durum than for Soft Red, HRS, and HRW ($P < 0.05$). Diet total-tract energy digestibility was lowest for Soft Red (86.5%), intermediate for Soft White, HRS and HW (87.2 to 87.5%) and highest for HRW and Durum (88.6 and 88.9%; $P < 0.05$); diet DE content followed a similar pattern. In summary, protein but not NSP content varied among 12 wheat cultivars harvested in 2001; wheat DE content ranged 7% and was highest for Durum. Decreases in ADFI and ADG for Durum and Soft wheat were limited to the first two wk, and did not exist after 3 wk. In conclusion, despite variations in DE content among wheat classes, young pigs fed all classes of wheat, including Soft and Durum, may grow adequately.

Key Words: Wheat, Pigs

217 Particle size, mill type, and added soy oil influence flowability of ground corn. C. N. Groesbeck*, R. D. Goodband, S.S. Dritz, M. D. Tokach, J. L. Nelssen, and C. W. Hastad, *Kansas State University, Manhattan.*

Decreasing particle size and adding fat to diets can improve pig performance and profitability. Limits to reducing grain particle size and amount of added fat are frequently based on the ability of the feed to flow through feed delivery systems and feeders. Additionally, grain ground with a roller mill typically has a more uniform particle size than that ground with a hammer mill. Thus, type of grinding is expected to affect feed flowability. Therefore, our objective was to evaluate the effects of mill type, particle size and added soy oil on the flowability of ground corn. Six different particle size samples were evaluated for each mill type. The particle size mean and standard deviation for the corn ground with a roller mill ranged from 1,235 (1.98) to 502 (1.97) and for the hammer-milled corn ranged from 980 (2.52), to 390 (2.12) microns. All samples were dried overnight and equilibrated to equal moisture content. Soy oil was then added at 0, 2, 4, 6, and 8 % to portions of each sample. Flowability was 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 flowability. There was a three way interaction between particle size, soy oil, and mill type ($P < 0.05$). Corn ground with a hammer mill without added soy oil had a similar angle of repose as the corn ground with a roller mill that had 6 % added soy oil. Angle of repose was increased as particle size was decreased and more soy oil was added. However, the rate of increase was lower as particle size was decreased and at reduced particle sizes the rate of increase was greater for hammer-milled corn compared to roller-milled corn. These data indicate that corn ground with a roller mill that has 6 % added soy oil should have similar flowability as hammer-milled corn without added soy oil.

Key Words: Particle Size, Hammer Mill, Roller Mill

218 Evaluation of dehulled, degermed corn for swine. D. C. Kendall*[1], A. M. Gaines[1], J. W. Frank[1], G. L. Allee[1], M. Bertram[2], and T. E. Sauber[3], [1]*University of Missouri, Columbia,* [2]*Pork Technologies, LLC, Ames, IA,* [3]*Pioneer-Dupont, West Des Moines, IA.*

Three experiments were conducted to determine the feeding value of dehulled, degermed (DD) corn for swine. In Exp. 1, 12 barrows (TR-4 × PIC C-22) were placed in metabolism crates and used in two 4-d collection periods to determine digestible energy (DE) values and apparent fecal digestibility in DD compared to normal corn. The dietary treatments were composed of 97.2% of either DD corn or normal corn and 2.8% of a mineral and vitamin premix. In Exp. 2, 98 barrows (TR-4 × PIC C-22) were used to determine if DD corn could be fed to pigs throughout the growing-finishing phase. Pigs were housed at 7 pigs/pen (7 reps/diet) and fed pelleted diets formulated to meet or exceed NRC (1998) recommendations for each phase of growth. Dietary phases occurred at 32-45, 45-64, 64-82, 82-100, 100-118 kg BW. In Exp. 3, 20 crossbred growing and 12 finishing barrows (TR-4 × PIC C-22) were used to determine the apparent fecal energy digestibility and fecal DM output of the diets from each phase in Exp. 2. In Exp. 1, apparent energy digestibility values were higher for pigs fed DD corn than normal corn (96.6 vs 88.3%, $P < 0.001$). DE values were higher for DD corn than for normal corn (4051 vs 3791 kcal/kg, $P < 0.001$). In Exp. 2, performance for the overall finishing period showed ADG was similar between the two corn sources, but ADFI was 6.3% lower ($P < 0.02$) and G:F was 5.4% higher ($P < 0.001$) for pigs consuming DD corn compared to normal corn. There was also higher mortality for pigs fed DD corn (18.4 vs 0%; $P < 0.004$), caused by gastric ulcers. The increased mortality can partially be attributed to small particle size (310 microns), a pelleted diet, and prolonged feeding of the DD corn. In Exp. 3, apparent fecal digestibility of energy was higher ($P < 0.001$) in each phase of growth for pigs fed DD corn compared to normal corn (0.96, 0.964, 0.971, 0.975, and 0.978 vs 0.924, 0.933, 0.922, 0.951, and 0.958%, respectively). The decrease in fecal DM output ranged from 42 to 60% ($P < 0.001$) when pigs were fed DD corn. These experiments demonstrate that DD corn can be utilized to increase diet digestibility and decrease fecal output, but factors contributing to gastric ulcers must be considered.

Key Words: Pigs, Dehulled Degermed, Corn

219 Comparison of grain sources (barley, white corn, and yellow corn) for swine diets and effects on performance and carcass traits. J. F. Lampe*, T. J. Baas, and J. W. Mabry, *Iowa State University, Ames.*

An experiment was conducted to evaluate the effect of energy source on performance and carcass traits of pigs. Dietary treatments (primary energy source) 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, 5) barley. Pigs were from two sires lines, Duroc and Hamp x Duroc, on PIC 1055 females. Pigs were randomly allocated to pens based on genetic type and gender using a 2 x 2 x 5 factorial arrangement with two genetic types, two sexes (barrows and gilts) and five dietary treatments. There were 8 pens per treatment with 26 pigs per pen. Diets were fed in four phases: phase one (27.6 to 49.3 kg), phase two (49.3 to 67.2 kg), phase three (67.2 to 103.3 kg), and phase four (103.3 to 130.2 kg). Diets were formulated to contain 1.12% Lys, 0.83% Ca, and 0.71% P; 0.93% Lys, 0.73% Ca, and 00.56% P; 0.71% Lys, 0.65% Ca, and 0.52% P; 0.65% Lys, 0.63% Ca, and 0.46% P for phases 1 to 4, respectively. Diets were supplemented with choice white grease, to maintain an iso-caloric status through phases one and two (67.2 kg). Choice white grease was limited to 1% in phases three and four (67.2 to 130.2 kg). Backfat (BF) and loin muscle area (LMA) were estimated one d prior to harvest by a trained technician using real-time ultrasound. Diet had no effect ($P > 0.05$) on ADG, ADFI, feed conversion (FG), ultrasound BF, or percent fat-free lean (FFL). Pigs fed diet 5 had a smaller ($P < 0.05$) LMA than pigs fed the other four diets. Pigs fed diet 5 had lower lean gain on test (LGOT) than pigs fed diets 1, 2 and 4, although diet 3 was not different ($P > 0.05$) from all treatment means. Duroc-sired pigs had greater ($P < 0.05$) LMA, LGOT, FFL, ADFI, and FG than Hamp x Duroc-sired pigs. Duroc-sired pigs had less ($P < 0.05$) BF than Hamp x Duroc-sired pigs. Results suggest that