

was determined at each research station using seven 35 kg barrows surgically fitted with ileal cannulas. The pigs were used in a 7x7 Latin square design. The experimental diets had 17% CP originating only from the test material, except for the casein diet. The pigs were fed twice daily 12 h apart. The feeding allowance was  $45 \text{ g kg}^{-0.75} \text{ meal}^{-1}$ . Following a 5-d adaptation period, ileal digesta were collected for two 12-h periods in 2 consecutive days for determination of ileal digestibility. Variation in amino acid digestibility was minor among and within sites with a tendency for one KS and one NL sample to have a higher digestibility than two other NL samples. Overall, the NL samples had less digestible Lys and Met than all other samples. Variation in digestibility of amino acids was small between locations. The soybean meals tested in this experiment were approximately 4% higher in total amino acids than that reported in the NRC (1998). True digestibilities, however, were similar to NRC values except for Cys and Thr, which were 5 and 3 percentage points lower in this experiment. These results show that the soybean meals evaluated from several locations were relatively consistent in their digestibility.

**Key Words:** Swine, Digestible amino acids, Soybean meal

**228 Effects of soybean meal particle size on amino acid and energy ileal digestibilities in grower-finisher swine.** N.D. Fastinger\* and D.C. Mahan, *The Ohio State University, Columbus.*

A study evaluated the effect of soybean meal (SBM) particle size reduction on subsequent amino acid and energy ileal digestibilities. Four levels of a SBM source were processed through a hammer mill to achieve average particle sizes of approximately 900, 600, 300, and 150 microns. Included in the seven treatments were two control diets, one containing another source of SBM (900 microns) and the other soy protein concentrate (SPC). The seventh treatment was a low-protein (5% casein) diet that was used to determine endogenous amino acid losses for calculating true digestibilities. Fourteen crossbred barrows with a mean body weight of 28 kg were surgically fitted with cannulas at the distal ileum. The experiment was a 7 x 7 Latin Square design conducted in two replicates. Treatment diets were fed at a constant level during each 7-d period with ileal digesta samples collected for 2-d following a 5-d adaptation period. The amount of feed provided was based upon metabolic body weight ( $0.09 \times \text{kg}^{.75}$ ) and was increased 150 to 200 g between each collection period. Apparent and true digestibility of amino acids was calculated using 0.50% chromic oxide as a dietary marker. Apparent digestibility of isoleucine, methionine, phenylalanine, and valine increased linearly ( $P < 0.05$ ) as particle size decreased. True digestibility of isoleucine, methionine, phenylalanine, and valine increased linearly ( $P < 0.05$ ) as particle size decreased. The average of the ten essential amino acids showed that both apparent and true digestibility increased as particle size decreased, whereas the average of the non-essential amino acid digestibilities was not affected. Energy digestibility was not affected by SBM particle size reduction. These results suggest that a reduction in particle size of SBM increased essential amino acid digestibility but had no effect on non-essential amino acid digestibility. The largest improvement in digestibility was obtained when soybean meal was approximately 600 microns.

**Key Words:** Soybean meal, Ileal digestibility, Particle size

**229 The influence of soy oligosaccharides on apparent and true ileal amino acid digestibilities and fecal consistency in growing pigs.** M. R. Smiricky\*, D. M. Albin, J. E. Wubben, V. M. Gabert, C. M. Grieshop, and G. C. Fahey, Jr., *University of Illinois, Urbana.*

Soybean oligosaccharides (OS), specifically raffinose and stachyose, have been implicated in impairing nutrient digestibility and causing flatulence. Little conclusive evidence exists concerning soy OS detrimental effects on the gastrointestinal tract, especially digestion. Fourteen ileally cannulated PIC pigs (BW = 35 kg) were randomly allotted to a 77 Latin square to evaluate the influence of raffinose and stachyose on nutrient digestibility and fecal consistency. Semipurified diets containing soy protein concentrate (SPC) or soybean meal (SBM) as the protein source were fed. Soy solubles (SS), a byproduct of SBM processing, was used to increase dietary raffinose and stachyose concentrations. The seven dietary treatments were SPC, SPC + 9% SS, SBM, SBM + 9% SS, SBM + 18% SS, SBM + 4% alpha-galactosidase, and a low protein

casein diet used to determine true digestibility. The diets were formulated to contain 17% CP and 0.5% chromic oxide. The experimental periods were divided into a 5 d adaptation followed by 2 d of ileal digesta collection. The diets and digesta were analyzed for DM, CP, Cr, amino acids, and raffinose and stachyose. Fecal consistency was measured via fecal scores on d 6 and 7 of each experimental period. The SPC + 9% SS diet resulted in depression ( $P < 0.05$ ) in the digestibilities of N and most amino acids. The digestibilities of N and amino acids were the same ( $P > 0.05$ ) for all SBM-containing diets, with the exception of the amino acids Tyr and Glu. The addition of alpha-galactosidase did not improve N or amino acid digestibilities with the exception of Val and Tyr. Raffinose digestibility was improved ( $P < 0.05$ ) by the addition of alpha-galactosidase, but was not affected by any other dietary treatment. Stachyose digestibility was decreased ( $P < 0.05$ ) in the SBM + 9% SS and SBM + 18% SS treatments. Fecal consistency was not affected ( $P > 0.05$ ) by dietary treatment. Soy OS have minor effects on digestibility in growing pigs when present at these concentrations.

**Key Words:** Pig, Digestibility, Oligosaccharides

**230 Characterizing the feeding value of extruded-expelled soybean meal (Express<sup>TM</sup>) with or without added fat in a commercial swine production facility.** M. J. Webster\*<sup>1</sup>, S. S. Dritz<sup>1</sup>, R. D. Goodband<sup>1</sup>, M. D. Tokach<sup>1</sup>, J. L. Nelsens<sup>1</sup>, J. C. Woodworth<sup>1</sup>, M. De La Latta<sup>1</sup>, and N. W. Said<sup>2</sup>, <sup>1</sup>Kansas State University, <sup>2</sup>Insta-Pro International.

A total of 1,200 gilts was used to evaluate the effects of replacing conventionally processed soybean meal with extruded-expelled soybean meal on finishing pig growth performance. Dietary treatments were arranged in a  $2 \times 3$  factorial with two sources of soybean meal (solvent extracted or extruded-expelled) and three levels of added fat (none, 3.4, and 7% initially than decreasing in the next three dietary phases). Energy levels were based such that the higher energy in extruded-expelled soybean meal (with or without added fat) was equal to that provided by solvent extracted soybean meal with added fat. From 24.5 to 61.2 kg, pigs fed extruded-expelled soybean meal had greater ADG and G/F compared to those fed solvent extracted soybean meal. Increasing added fat in either extruded-expelled- or solvent extracted soybean meal-based diets, increased ADG and G/F (linear,  $P < 0.0003$ ). From 61.2 to 122.5 kg, pigs fed extruded-expelled soybean meal and/or increasing added fat had decreased feed intake ( $P < 0.04$ ). For the overall growing-finishing period, ADG was unaffected ( $P > 0.61$ ) by increasing energy density. However, ADFI was decreased ( $P < 0.05$ ; 1.96 vs. 1.91 kg/d) and G/F increased ( $P < 0.02$ ; .382 vs. .391) as energy density of the diet was increased with extruded-expelled soybean meal. Increasing added dietary fat also reduced (linear,  $P < 0.01$ ) ADFI (1.98, 1.93, and 1.88 kg/d) and increased (linear,  $P < 0.01$ ) G/F (.375, .387, and .398). Carcass leanness was not affected by dietary treatment. These results indicate that increasing dietary energy density by using extruded expelled soybean meal and/or added fat, improves feed efficiency in finishing pigs reared in a commercial environment.

**Key Words:** Soybean meal, Processing, Finishing pigs

**231 Comparison of extruded/expelled soybean meal with conventionally processed soybean meal in swine diets from weaning to market weight.** A. M. Tucker\*, P. S. Miller, A. J. Lewis, and R. L. Fischer, *University of Nebraska, Lincoln.*

Two consecutive studies were conducted to evaluate the efficacy of replacing conventionally processed soybean meal (SBM) with extruded/expelled SBM (ESBM) in swine diets from weaning to slaughter. Experiment 1 was a randomized block design and used 480 pigs (240 barrows and 240 gilts; initial BW = 4.1 kg) in a 28-d nursery trial. There were two, 14-d feeding phases, and pigs were given ad libitum access to feed and water. Pen was the experimental unit, and pigs were fed either a control diet (C) or a diet containing ESBM (E). Diets were formulated on an equal lysine basis. Pigs fed C grew 16% faster ( $P < 0.05$ ) and were 14% more efficient ( $P < 0.05$ ) than those fed E. There was no difference in ADFI. However, plasma urea concentrations (PUC) were greater ( $P < 0.05$ ) for pigs fed the E diet than for pigs fed C. Experiment 2 was a growing-finishing trial that used 240 pigs (120 barrows and 120 gilts) from Exp. 1 (initial BW = 12.5 kg) in a  $2 \times 2$  factorial arrangement. Pigs were fed either a C or E diet and there were four possible Exp. 1-Exp. 2 diet combinations (C-C, C-E, E-C, or E-E). Diets were formulated on an equal lysine basis, and there were three feeding phases (12 to