

was greater ($P < .05$), and fat free lean index lower ($P < .10$), for pigs fed naked oats. Carcass yield and percent lean values were similar among the three test grains. Addition of 10% canola seed, as a methionine source, resulted in nearly equal growth performance. Diets containing canola seed reduced fat depth ($P < .05$) and increased fat-free lean index ($P < .05$). Diets fortified with field peas adequately supply protein and energy for the growing-finishing pig, while dietary inclusion of canola seed may enhance carcass quality.

Key Words: Pigs, Field peas, Canola seed

168 Nutritional value of genetically improved high-lysine, high-oil corn for young pigs. P. R. O'Quinn^{*1}, J. L. Nelssen¹, R. D. Goodband¹, D. A. Knabe², J. C. Woodworth¹, M. D. Tokach¹, and T. T. Lohrmann³, ¹Kansas State University, Manhattan, ²Texas A&M University, College Station, ³Optimum Quality Grains, L. L. C., Des Moines, IA.

Two trials were conducted to compare the nutritional adequacy of genetically improved high-lysine, high-oil corn (.408% lysine, 6.21% fat; as-fed basis) and high-oil corn (.289% lysine, 5.97% fat; as-fed basis) for young pigs. Experiment 1 used four non-littermate barrows (initially 20 kg) fitted with ileal T-cannula in a crossover-designed digestion study. The .80% total lysine diets contained 8.5% casein and equal amounts of lysine from the test corn. Apparent digestibilities of amino acids, GE, DM, CP, and ash were similar ($P > .10$) between diets. Apparent digestibilities of lysine, threonine, and total sulfur amino acids were 68, 61, and 78% and 72, 62, and 80% for the high-oil corn and high-lysine, high-oil corn, respectively. Digestibilities were calculated by difference assuming 100% digestibility for casein. Experiment 2 used 100 barrows (initially 8.4 kg and 27 d of age) in a 2 x 2 factorially designed growth trial lasting 10 d. Main effects were corn type and dietary lysine (.80 or 1.15% digestible lysine). The corn-soybean meal-dried whey based diets contained equal amounts of all dietary ingredients within each lysine level except L-Lysine-HCl was added to the high-oil corn diets to make them isolysin. A fifth diet (.80% digestible lysine high-oil corn diet plus .23% L-Lysine-HCl) verified that lysine was the first limiting amino acid for growth. Increasing lysine increased ADG ($P < .001$) and improved feed efficiency (G:F; $P < .001$) regardless of corn type. Within lysine level, corn type did not affect ADG, ADFI, or G:F ($P > .10$). Combined ADG and G:F were 347 g and .64 and 442 g and .79 for the .80 and 1.15% digestible lysine diets, respectively. These results suggest that the lysine in high-lysine, high-oil corn is as available as the lysine in high-oil corn, and that high-lysine, high-oil corn can be successfully used in swine diets.

Key Words: Digestibility, High-oil corn, High-lysine, high-oil corn

169 Evaluation of high-oil corn feeding strategies for grow-finish pigs. D. C. Kendall, K. A. Bowers^{*}, B. T. Richert, and T. R. Cline, Purdue University, West Lafayette, IN.

One hundred ninety two pigs (96 barrows (B), 96 gilts (G); initial BW=25 kg) were used to evaluate feeding high-oil corn (HOC) or normal corn (NC) to grow-finish pigs. Average daily gain (ADG), average daily feed intake (ADFI), and gain to feed ratio (G/F) were determined at 14-day intervals. Fat and loin depth, percent lean, carcass weight, and carcass premium were determined at slaughter. Pigs were blocked by sex, ancestry, and weight into 32 pens (6 pigs/pen) and fed one of four dietary treatments: 1) NC diet 16 weeks (NC/NC); 2) NC diet for the first 8 weeks, period 1 (P1), and HOC diet for the second 8 weeks, period 2 (P2), (NC/HOC); 3) HOC diet during P1 and NC diet during P2 (HOC/NC); and 4) HOC diet for 16 weeks (HOC/HOC). The HOC and NC diets were fed at the same Lys:Cal ratio by BW and sex of the pigs. BW and g Lysine/Mcal ME for B and G, respectively, were: 1) 25 to 45 kg, 2.89 and 3.19; 2) 45 to 68 kg, 2.42 and 2.72; 3) 68 to 91 kg, 1.96 and 2.26; 4) 91 to 113 kg, 1.65 and 1.95. This project was conducted from May to August, 1998. Pigs fed HOC had greater G/F in P1 (.400 vs. .387; $P < .05$) and also in P2 (.280 vs. .270; $P < .05$). Barrows had higher ADG in P1 (851 vs. 807 g/d; $P < .01$) and P2 (812 vs. 757 g/d; $P < .01$) and greater ADFI in P1 (2188 vs. 2044 g/d; $P < .05$) and P2 (2998 vs. 2729 g/d; $P < .05$). Pigs fed NC/NC had a greater fat depth ($P < .01$) and decreased loin depth ($P < .01$) compared to pigs fed HOC/HOC. Barrows had a greater fat depth (25.1 vs. 20.0 mm; $P < .0001$). Gilts had a greater loin depth (59.4 vs. 55.9 mm; $P < .0001$) and percent lean (53.2 vs. 51.3; $P < .0001$). Gilts also had a higher

carcass premium (\$.0871/kg vs. \$.0291/kg; $P < .0001$). Barrows had a higher carcass weight at slaughter (90.7 kg vs. 88.0 kg; $P < .01$). These results suggest that HOC can increase G/F in grow-finish pigs. High-oil corn may also reduce backfat and increase loin depth when fed throughout the grow-finish period during hot weather.

Key Words: Pigs, Grow-finish, High-oil corn

170 A protease complement increases fecal digestibility coefficients in pigs fed soybean meal and canola meal. J. R. Pluske¹, P. C. H. Morel¹, E. A. C. James¹, and K. A. Jacques^{*2}, ¹Monogastric Research Centre, Massey University, Palmerston North, New Zealand, ²Alltech Inc., Nicholasville, Kentucky, USA.

Thirty entire male pigs (initial BW 47.8 kg) were used to test the hypothesis that addition of an enzyme complement (Allzyme Vegpro, Alltech, Inc.) to diets containing soybean meal (SBM) and canola meal (CM) would increase apparent fecal nutrient digestibility. Pigs were blocked by weight and randomly assigned to four barley-based dietary treatments in a 2 x 2 factorial arrangement of vegetable protein source (SBM, 250 g/kg; and CM, 340 g/kg) and enzyme (0 and 100 mg/kg Vegpro). A basal diet consisting of barley with added vitamins and minerals, in the presence and absence of enzyme complement, was also fed. Pigs were group-housed but individually fed twice daily an amount equivalent to 10% W^{0.75}. The amount fed was adjusted weekly, and diets were fed in meal form. Water was available *ad libitum*. Chromic oxide was added as an indigestible marker (4 g/kg). After an adaptation phase of seven days, feces were collected from each pig each morning for the ensuing five days. Feces were then pooled, freeze-dried, and analyzed for GE, N and OM. Apparent fecal digestibility coefficients for both the complete diet and the vegetable protein source *per se* were calculated. No interactions between vegetable protein source and enzyme occurred. However, main effects of vegetable protein source and enzyme on apparent fecal digestibility coefficients were observed. For the type of vegetable protein ingredient, digestibility coefficients of GE (83.1 vs. 57.8%), OM (80.7 vs. 55.5%) and N (83.4 vs. 69.5%) were higher ($P < .001$) in SBM than in CM. Addition of the enzyme improved the digestibility of GE (73.2 vs. 67.7%, $P = .008$) and OM (71.1 vs. 65.0%, $P = .010$), but not that of N (77.3 vs. 75.5%, $P = .19$). These data suggest that the efficiency of utilization of vegetable protein sources commonly fed to pigs can be improved by the use of an enzyme complement.

Key Words: Pigs, Fecal digestibility, Enzyme

171 The influence of hydrolysis time, hydrochloric acid concentration and measurement method on the determination of amino acid levels in soybean products included in swine diets. D.M. Albin^{*}, J.E. Wubben, and V.M. Gabert, University of Illinois, Urbana, IL.

Accurate determination of amino acid (AA) levels in soy products used in swine diets facilitates optimum diet formulation and AA supplementation. A study was carried out to investigate the effect of hydrolysis time, acid concentration and method of AA measurement on AA levels. Correction factors to standardize AA levels to 24 h of hydrolysis were also determined. The samples evaluated were: whole soybeans, soybean hulls, soybean meal (SBM), soy protein concentrate (SPC) and soy protein isolate. Hydrolysis was carried out in an oven at 110°C for 0, 2, 6, 10, 16, 24, 32, 44, 56 or 72 h. In the second part of the study, samples were hydrolyzed for 24 h in 1, 3, 6, 9 or 12 M HCl. Ion-exchange chromatography (IEC) was used to determine AA levels in SBM and SPC. Pre-column derivatization with phenyl isothiocyanate (PITC) was used to determine AA concentrations in all of the samples. After 24 h of hydrolysis, lysine in SBM was higher ($P < .01$) when determined with PITC (3.27% DM) than with IEC (2.77% DM). Lysine level for SPC, determined with PITC (4.47% DM), was higher ($P < .05$) than that determined with IEC (3.83% DM). Both hydrolysis time and acid concentration affected ($P < .05$) AA levels. Use of 6 M HCl did not always provide the highest AA levels in the samples. In SBM, lysine level was highest ($P > .05$) after 32 h (3.38% DM) of hydrolysis. After 24 h of hydrolysis, lysine level in SBM was 3.27% DM. The correction factor for this sample was 1.03. In SBM, 6 M HCl provided the highest ($P > .05$) threonine level (2.53% DM), however the highest ($P > .05$) arginine level (4.27% DM) was obtained with 9 M HCl. In conclusion, measurement method, hydrolysis time and acid concentration are important factors which affect AA levels. Standard hydrolysis conditions do not always