RESEARCH ABSTRACT

ANIMAL SCIENCE

Revised

Title: Effects of reducing the particle size of corn on the concentration of digestible and metabolizable energy and on the digestibility of energy, phosphorus, and amino acids by growing pigs - **NPB** #: 11-170

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Scientific Abstract:

Three experiments were conducted to determine the concentration of DE and ME, the standardized total tract digestibility (STTD) of P, the standardized ileal digestibility (SID) of CP and AA, and the effect on growth performance and carcass characteristics of pigs fed corn ground to 4 different particle sizes (i.e., 339, 485, 677, and 865 μm). In Exp. 1, 40 growing barrows (initial BW 22.8 ± 2.1 kg) were placed in metabolism cages and allotted to a randomized complete block design with 4 diets and 10 replicate pigs per diet. One lot of corn was divided into 4 batches that were ground to the specified particle sizes and each batch was used in one diet that contained 97.7% corn (as-fed basis). Vitamins and minerals were included in the diets to meet the requirements for growing pigs with the exception that no inorganic P was used and all the P in the diets originated from corn. The concentration of ME was 3,964, 3,895, 3,868, and 3,826 kcal/kg DM for corn ground to a mean particle size of 339, 485, 677, and 865 μm, respectively. The ME concentration decreased (linear and quadratic, $P <$ 0.01) as the particle increased. The STTD of P was 37.79, 37.12, 37.27, and 37.38% for corn ground to a mean

particle size of 339, 485, 677, and 865 μm, respectively, and these values were not different. In Exp. 2, 10 growing barrows (initial BW: 29.2 ± 1.35 kg) were surgically equipped with a T-cannula in the distal ileum and randomly allotted to a replicated 5 × 5 Latin square design with 5 diets and 5 periods in each square. Four of the diets contained each batch of corn ground to a different particle size (96.55%, as-fed basis) as the only source of AA. A N-free diet was used to determine endogenous losses of CP and AA. With the exception of Trp, there was no impact of corn particle size on the SID of CP or any indispensable AA. In Exp 3, 36 gilts and 36 barrows (initial BW: 32.00 ± 1.58 kg) were allotted to 4 dietary treatments in a 3 phase program with phase 1 diets being offered from 32 to approximately 62 kg, phase 2 diets from approximately 62 to 94 kg, and phase 3 diets from approximately 92 to 130 kg. All diets were based on corn, soybean meal, and added soybean oil and the 4 dietary treatments were obtained by using corn ground to a mean particle size of 339, 485, 677, and 865 μm, respectively. Because of the increased ME in corn ground to the smaller particle size compared with the greater particle size, it was possible to reduce the amount of added fat in diets containing corn ground to a smaller particle size compared with diets containing corn ground to a greater particle size without changing the ME of the diet. Within each phase, all diets were formulated to contain equal quantities of ME per kg, but diets formulated with the corn ground to 865 microns contained 1.60, 1.74, and 1.87% more soybean oil than diets containing corn ground to 339 microns for phase 1, phase 2, and phase 3, respectively. Pigs were randomly allotted to the 4 dietary treatments in a 2 × 4 factorial design with sex (gilts and barrows) and diet as factors. Each of the treatments contained 18 replications (9 gilts and 9 barrows). The final BW, ADFI, ADG, G:F ratio, hot carcass weight, and dressing percentage were not different among treatments. In conclusion, reduction of the particle size of corn from 865 to 339 μm linearly increased the concentration of ME in the corn, but the particle size of corn does not affect the STTD of P or the SID of indispensable AA and CP. As a consequence, by using corn ground to a smaller particle size, the amount of fat can be reduced in the diets without affected animal growth performance or carcass composition, which will reduce the cost of formulating diets containing corn ground to a smaller particle size.