

ANIMAL SCIENCE

Title: Effects of body weight and research conditions on the determination of the productive energy content of corn germ meal fed to growing-finishing pigs - **NPB #17-116**

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Scientific Abstract:

Four experiments were carried out to investigate the energy content of corn germ meal (CGM). Experiments 1 and 2 were growth studies carried out at either a Commercial or a University site to evaluate the effect of research conditions on estimates of the productive energy (PE) content of CGM. The 2 experiments used a RCBD with 3 dietary treatments: 1) Control (corn-soybean meal-based); 2) CGM-No Fat (20% CGM; 4.8% lower ME than Control); 3) CGM+Fat (20% CGM + yellow grease; same ME as Control); and 4 growth periods: Early Growing (E-G; 29-64 kg BW), Late Growing (L-G; 64-96 kg BW), Finishing (F; 96-127 kg BW), and Growing Finishing (G-F; 29-127 kg BW). At the commercial site, the CGM+Fat diet was fed in G-F only. One diet phase was used in each of the E-G, L-G, and F periods. Diets for both experiments were made at the same feed mill using the same batches of ingredients and were formulated to the same SID lysine:ME ratio within phase, and to meet or exceed nutrient requirements proposed by NRC (2012). The ME value of CGM used to formulate diets was 2,548 kcal/kg. A total of 3,672 and 576 barrows and gilts housed in mixed-sex groups of 34 and 4 were used in Exp. 1 and 2, respectively, giving 12 replicates/diet/growing period at each site. Statistical analysis was carried out within experiment and growing period with pen as the experimental unit using PROC MIXED or PROC TTEST of SAS; the model accounted for the effects of dietary treatment and block. The Control diet was used as the reference diet to compare with the CGM diets to estimate PE. Caloric efficiency (calories consumed per unit of BW gain) was calculated for each diet and growth period. The effect of dietary treatment on growth performance was relatively similar at the 2 research sites. Compared to the Control treatment, ADG was lower ($P < 0.05$) and F:G greater ($P < 0.05$) for pigs on the CGM-No Fat treatment in E-G, L-G, and G-F but not F period at the Commercial site and in L-G and G-F but not E-G and F at the University site. Pigs on the CGM+Fat treatment generally had similar ($P > 0.05$) growth performance to those on the Control treatment. There was no effect of dietary treatment on caloric efficiency in E-G, L-G, and G-F periods at the Commercial site or in E-G and F periods at the

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University site. Caloric efficiency for the CGM-No Fat compared to the Control diet was lower ($P < 0.05$) at the Commercial site in F (9,913 and 10,318 kcal/kg, respectively; SEM 91.2) but was greater ($P < 0.05$) in L-G (8,464 and 8,078 kcal/kg, respectively; SEM 137.9) and G-F (8,461 and 8,126 kcal/kg, respectively; SEM 95.1) at the University site. For the Commercial site, estimates of PE of CGM were similar ($P > 0.05$) for CGM-No Fat diet in E-G, L-G, and G-F periods (2,465, 2,568, and 2,439 kcal/kg, respectively) and for the CGM+Fat diet in G-F (2,508 kcal/kg); however, PE was greater ($P < 0.05$) for the F period (3,193 kcal/kg). At the University site, PE estimates were more variable than at the Commercial site, both between growth periods and between the CGM diets. For example, PE based on the CGM-No Fat treatment for E-G, L-G, and G-F was 2,455, 1,829, and 1,924 kcal/kg, respectively ($P > 0.05$), and on the CGM+Fat treatment for the same periods was 2,898, 2,215, and 2,819 kcal, respectively, ($P > 0.05$). Estimates of PE based on the F period were generally greater than those for other periods for the CGM-No Fat treatment at both the Commercial and University site (3,193 and 3,086 kcal/kg, respectively) and for the CGM+Fat treatment at the University site (3,095 kcal/kg). Experiments 3 and 4 were metabolism studies that measured the ME of corn and CGM, and of the 3 diets used in the E-G period, respectively. Measured ME of corn and CGM in Exp. 3 was 3,489 and 2,828 kcal/kg, respectively, which are similar to NRC (2012) values. Measured ME of the Control, CGM-No Fat, and CGM+Fat diets was 3,332, 3,250, and 3,442 kcal/kg, respectively, which were 36, 112, and 145 kcal/kg, respectively, greater than formulated values for these diets. These results suggest that estimating PE from large-scale, controlled research studies carried out under commercial conditions would be more appropriate than using relatively small-scale studies under university conditions. Also, PE can be accurately determined over a relatively limited weight range in the growing period rather than over the entire growing-finishing period. Finally, ME values from metabolism studies generally overestimated the energy available to the pig for growth which emphasizes the potential benefit of using the PE approach.