

Title: Utilizing Glycerol in Swine Diets: I. Feed Manufacturing Considerations and Nutritional Strategies to Reduce Dietary Costs – **NPB #07-151**

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Scientific Abstract:

Experiments were conducted to: 1) determine the glycerol effects on diet flowability with different ingredients; and 2) evaluate glycerol effects on pellet mill production and pig performance. In the first series of experiments, the effects of added soybean oil, glycerol, or a 50:50 soybean oil/glycerol blend were examined in combination with ground corn or ground corn with spray-dried whey. Angle of repose was the criteria used to estimate flowability. There was a mill type \times liquid source \times percent liquid added interaction ($P < 0.05$) observed. Roller mill ground grain decreased angle of repose (AOR), improving flow ability compared with HM ground grain. Increasing soy oil increased AOR, decreasing flow ability. Increasing glycerol or the 50:50 soy oil/glycerol blend decreased AOR, improving flow ability when added to HM ground maize. There was a spray-dried whey level \times percent liquid added \times liquid source interaction ($P < 0.05$) observed. The addition of glycerol or the 50:50 soy oil/glycerol blend decreased AOR, improving flow ability. Increasing soy oil increased AOR regardless of spray-dried whey concentration. In the following studies, glycerol effects in diets on pellet mill production efficiency and nursery pig growth performance was evaluated. Diets were formulated to contain 0, 3, 6, 9, 12, and 15% glycerol. All diets were steam conditioned to 65.5°C and pelleted through a pellet mill equipped with a die that had an effective thickness of 31.8 mm and holes 3.96 mm in diameter. Increasing crude glycerol increased both the standard (linear and quadratic, $P < 0.01$) and modified (linear, $P < 0.01$; quadratic, $P \leq 0.02$) pellet durability indexes up to 9% with no further benefit thereafter. The addition of crude glycerol decreased (linear; $P < 0.01$) production rate (t/h) and production efficiency (kWh/t). A total of 182 pigs (initial BW, 11.0 \pm 1.3 kg; 5 or 6 pigs/pen) were fed 1 of 7 corn-soybean meal-based diets with no added soy oil or crude glycerol (control), the control diet with 3 or 6% added soy oil, 3 or 6% added crude glycerol, and 6 or 12% addition of a 50:50 (wt/wt) soy oil/crude glycerol blend with 5 pens/diet. The addition of crude glycerol lowered ($P < 0.01$) delta temperature, amperage, motor load, and production efficiency. The addition of crude glycerol improved ($P < 0.01$) pellet durability compared with soy oil and the soy oil/crude glycerol blend treatments. Pigs fed increasing crude glycerol had increased (linear, $P = 0.03$) ADG. Avera daily

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gain tended to increase with increasing soy oil (quadratic; $P = 0.07$) or the soy oil/crude glycerol blend (linear, $P = 0.06$). Adding crude glycerol to the diet did not affect G:F compared with the control. Gain:feed tended to increase with increasing soy oil (linear, $P < 0.01$; quadratic, $P = 0.06$) or the soy oil/crude glycerol blend (linear, $P < 0.01$; quadratic, $P = 0.09$). Nitrogen digestibility tended ($P = 0.07$) to decrease in pigs fed crude glycerol compared with pigs fed the soy oil treatments. Apparent digestibility of GE tended ($P = 0.08$) to be greater in the pigs fed soy oil compared with pigs fed the soy oil/crude glycerol blends. In conclusion, adding crude glycerol to the diet before pelleting increased pellet durability and improved feed mill production efficiency. The addition of 3 or 6% crude glycerol, soy oil, or a blend of soy oil and glycerol in diets for 11- to 27-kg pigs tended to increase ADG. For pigs fed crude glycerol, this was a result of increased ADFI, whereas, for pigs fed soy oil or the soy oil/crude glycerol, the response was a result of increased G:F.