Title: Evaluation of crude glycerin in swine - **NPB Project #07-165**

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Abstract

Apparent DE and ME of various crude glycerins from different biodiesel production facilities were empirically determined in nursery pigs (10.4 kg initial BW) in order to predict their DE and ME based on crude glycerin composition. Dietary treatments consisted of a basal diet, or diets containing crude glycerin from various biodiesel production facilities supplemented in the diet at approximately 9.1%. Because of bulk density differences, two glycerin sources were supplemented at either 7.7 or 6.9%. In addition, soybean oil and lard were included at 6.7% as dietary treatments to serve as positive controls. Each diet was fed twice daily to pigs in individual metabolism crates. After a 6-d adjustment period, a 4-d balance trial was conducted. During the collection period, feces and urine were collected daily and stored at 0°C until analysis. The GE of each test ingredient, diet, and urine and fecal samples from each pig were determined by isoperibol bomb calorimetry. Digestible energy of the diet was calculated by subtracting fecal energy from the GE in the feed, whereas ME was calculated by subtracting the urinary energy from DE. The DE and ME values of crude glycerol were estimated by difference where the DE and ME content of the basal diet was subtracted from the complete diet containing the test ingredient. Gross energy, DE, and ME of USP-grade glycerin was calculated to be 4,325, 4,443, and 3,664 kcal/kg, respectively. In contrast, GE of the crude glycerin samples ranged from 3,173 to 6,021, DE from 3,022 to 5,228, and ME from 2,535 to 5,206 kcal/kg, reflecting the content of glycerol, methanol, and free fatty acids in the crude glycerin. The GE, DE, and ME of soybean oil and lard was determined to be 9,443, 8,567, 8,469, and 9,424, 8,543, and 8,639 kcal/kg, respectively. The stepwise regression prediction of the ME in crude glycerin exhibited R^2 of only 0.42, whereas prediction of GE achieved a R^2 of 0.99 [GE kcal/kg as-is basis = -306 + (46.65 × % glycerin) + (54.31 × % methanol) + (101.83 × % fatty acids)]. On average, the ME of crude glycerin was 85.4% of its GE (SD 17.2) and did not differ by glycerin source. Data provided in these experiments indicate that crude glycerin is a valuable energy source with its GE concentration dependent upon the concentration of glycerin, methanol, and fatty acids, and its ME as a percent of GE being constant, at 85.4%.