Effects of nutrition on digestion efficiency and gaseous emissions from slurry in growing pigs: II. Effect of protein source in practical diets

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ABSTRACT

This research aimed to investigate effects of protein source in practical diets on nutrient excretion and potential emissions of ammonia (NH_3) and methane (CH_4) in pigs. Three experimental feeds were designed to substitute a mixture of soybean meal and soybean hulls (SB diet) with sunflower meal (SFM) or wheat DDGS (WDDGS). The proportion of other ingredients was also modified in order to maintain similar nutrient contents across diets. Changes in protein source led to differences in dietary content of neutral detergent insoluble crude protein, soluble fibre (SF) and acid detergent lignin. Twenty-four pigs (8 per diet), weighing 52.3 or 60.8 kg at the first and second batch, respectively, were housed individually in metabolic pens to determine during a 7-day period dry matter (DM) balance, coefficients of total tract apparent digestibility (CTTAD) of nutrients, and faecal and urine composition. Representative slurry samples from each animal were used to measure NH_3 and CH_4 emissions over an 11 and/or 100-day storage period, respectively. Neither DM intake, nor DM or energy CTTAD differed among experimental diets, but type of feed affected ($P < 0.001$) crude protein (CP) digestibility, which was highest for SFM (0.846) than for SB (0.775) diet, with WDGGS-based diet giving an intermediate value (0.794). Faecal DM composition was influenced ($P < 0.001$) accordingly, with the lowest CP concentration found for diet SFM and the highest for SB. The ratio of N excreted in urine or faeces decreased from SFM (1.63) to SB diet (0.650), as a consequence of both lower urine and higher faecal losses, with all the faecal N fractions increasing in parallel to total excretion. This result was parallel to a decrease of potential NH_3 emission (g/kg slurry) in diet SB with respect to diet SFM (from 1.82 to 1.12, $P < 0.05$), giving slurry from WDGGS-based diet an intermediate value (1.58). Otherwise, SF and insoluble neutral detergent fibre (aNDFom) CTTAD were affected ($P < 0.001$ and $P = 0.002$, respectively) by type of diet, being lower for SFM than in SB-diet; besides, a higher content of aNDFom (491 vs 361 g/kg) on faecal DM was