Effect of increasing inclusion rates of tofu by-product in diets of growing pigs on nitrogen balance and ammonia emission from manure

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To reduce competition with human-edible feed resources, it is of interest to incorporate by-products from the food industry in animal feeds. The current research investigated the effect of including increasing amounts of tofu by-product (TF) in practical pig diets on animal performance, nitrogen balance and ammonia emissions from manure. Two experiments were conducted including a control diet without TF, containing 160 g/kg dietary non-starch polysaccharides (NSPs) and three diets including 122, 246 and 360 g TF/kg DM (TF122, TF246 and TF360, respectively) to reach 220, 280 and 360 g/kg NSP. All diets had the same level of CP and protein digestible in the small intestine which particularly was realized by replacing rice bran with TF. Animal performance was assessed in a first experiment with 40 growing barrows with initial BW of 26.6 ± 1.80 kg (M ± SD) being allocated to the 4 treatments, during 2 growth phases (i.e. until 50 kg BW and from 50 to 80 kg BW). In the growth phase until 50 kg, feed intake and average daily gain (ADG) were linearly reduced by dietary TF inclusion, while this negative impact disappeared during the second growth phase (50 to 80 kg BW). Tofu by-product inclusion even positively affected the feed conversion ratio during this second growth phase (3.4 to 2.7 kg feed/kg ADG for 0 to 360 g/kg dietary TF). Over the entire growth period, performance and feed intake were negatively affected at the highest dietary TF level. Experiment 2 was conducted to assess digestibility, nitrogen balance and ammonia emission from manure. For this purpose, 16 pigs with BW of 62.8 ± 3.6 kg (M ± SD) were assigned to either 1 of the 4 treatments. There was no difference in total tract apparent digestibility of dietary organic matter or CP, while NDF digestibility increased with increasing TF level, suggesting increasing importance of the hindgut fermentation when digesting diets with increasing TF levels. Nevertheless, this was not reflected in increasing levels of faecal volatile fatty acids or purines, nor in reduced manure pH. As a result, ammonia emission from slurry was not reduced through dietary TF inclusion, despite the linear decrease in urinary nitrogen. In conclusion, TF can be included in pigs’ diets up to an inclusion rate of 25% without risk of impaired animal performance; however, this dietary strategy fails to mitigate ammonia emission from slurry.

Keywords: volatile fatty acids, nitrogen excretion, non-starch polysaccharides, swine production, slurry