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Chapter 10 Feeding biofuels co-products to pigs

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ABSTRACT

Dried distillers grains with solubles (DDGS) and other co-products from the fuel ethanol industry may be included in diets fed to pigs in all phases of production. The concentration of digestible energy (DE) and metabolizable energy (ME) in DDGS and maize germ is similar to maize, but high-protein dried distillers grain (HPDDG) contains more energy than maize. In contrast, if the oil is removed from DDGS, the co-product will have a lower energy concentration than maize or conventional DDGS. Glycerin is a co-product from the biodiesel industry and also contains more energy than maize. Phosphorus in DDGS and HPDDG is highly digestible to pigs, and apparent total tract digestibility (ATTD) values of approximately 60 percent have been reported for these ingredients. In contrast, the digestibility of phosphorus in maize germ is much lower and similar to maize. The concentration of starch in DDGS is low (between 3 and 11 percent on an as-fed basis), but the concentration of fat in DDGS is approximately 10 percent and the concentration of acid-detergent fibre (ADF), neutral-detergent fibre (NDF), and total dietary fibre in DDGS is approximately three times greater than in maize (9.9, 25.3 and 42.1 percent, respectively). The ATTD of dietary fibre is less than 50 percent, which results in low digestibility values for dry matter (DM) and energy in DDGS. The concentration of most amino acids in DDGS is approximately three times greater than in maize, but the standardized ileal digestibility (SID) of most amino acids average approximately 10 percentage units less than in maize. The same is the case for maize germ and HPDDG. Nursery pigs, beginning at two to three weeks post-weaning, and growing-finishing pigs may be fed diets containing up to 30 percent DDGS without any negative impact on pig growth performance, if they are formulated on a SID amino acid basis using crystalline amino acids to ensure that all digestible amino acid requirements are met.

However, carcass fat in pigs fed DDGS-containing diets has a higher iodine value (unsaturated to saturated fatty acid ratio) than in pigs fed no DDGS. As a result, it may be necessary to withdraw DDGS from the diet of finishing pigs during the final three to four weeks prior to harvest to achieve desired pork fat quality. High-protein DDGS may be used in diets fed to growing-finishing pigs in quantities sufficient to replace all of the soybean meal, and at least 10 percent of maize germ. Up to 30 percent de-oiled DDGS can be included in diets fed to weanling pigs, but results from one experiment indicate that adding de-oiled DDGS at any level to growing-finishing pig diets results in reduced growth rate and feed conversion. Due to limited research on this co-product, it is unclear if this is a valid and repeatable finding. Crude glycerin can be included in diets fed to weanling and growing-finishing pigs in quantities of up to 6 and 15 percent, respectively, and lactating sows fed diets containing up to 9 percent crude glycerol perform similarly to sows fed a standard maize-soybean meal diet. Lactating sows can be fed diets containing up to 30 percent DDGS, and DDGS can replace all of the soybean meal in diets fed to gestating sows without negatively impacting sow or litter performance. Inclusion of DDGS in diets fed to pigs may improve intestinal health and the immune system activation, but more research is needed to elucidate the mechanism responsible for these effects. Manure volume will increase if DDGS is included in the diet because of the reduced dry matter digestibility. Nitrogen excretion may also increase, but this can be prevented by the use of crystalline amino acids in diets containing DDGS. In contrast, P excretion can be reduced in diets containing DDGS if the total dietary concentration of P is reduced to compensate for the greater digestibility of P in DDGS.

INTRODUCTION

Distillers co-products have been used in swine diets for more than 50 years, but the rapid growth of the United

States fuel ethanol industry in the past decade has dramatically increased the total quantities of distillers co-products available to the livestock and poultry industries. Distillers

