Distillers Byproducts for Swine Diets

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Introduction

Historically, distillers grains have been a simple alternative energy source when corn is in short supply or expensive. However, the inclusion of distillers grains in swine diets may soon increase due to the increased usage of ethanol gas due to the banning of MTBE and the recent construction of an ethanol plants in Macon and Malta Bend, Missouri. Thus, more distiller grains are available in the area at a reasonable price.

Distillers grains are a byproduct of the alcohol manufacturing industry. During the alcohol production process, live yeast culture, enzymes and other additives are mixed with milled corn or other high quality grains. The mixture alone with water, is sealed in an airtight vessel, and allowed to ferment. After the fermentation process is complete, the mixture is screened from the liquid. The liquid fraction is stilled to produce alcohol. The solid fraction is pressed to remove the excess moisture and is then dried and ground to produce distillers dried grains (DDG). After the alcohol has been removed from the liquid fraction, the remaining is evaporated to concentrate the soluble material into condensed distillers solubles (20 to 40 % dry matter) or dried and ground to create dried distillers solubles (DDS). Dried distillers solubles (DDS) is usually mixed with the DDG to form distillers dried grains with solubles (DDGS).

Nutritional Profile

Distillers grains nutrient profile varies slightly to the typical energy source of swine diets, yellow dent corn. Distillers grain has higher protein (25 to 30 %), fat (8 to 10 %), and fiber (4 to 12 %) content than corn due to the fermentation process removing the starch component. Distillers byproducts do have several features that limit their use in swine diets. The high fiber content may cause diarrhea in young pigs. Distillers grains will have lower metabolizable energy content due to less starch. The crude protein content is relatively high, but the amino acid profile is not well balanced. For example, distillers grains are quite low in lysine content (0.6 to 0.9 %). Therefore, swine diets containing distillers dried grain with solubles (DDGS) need to be formulated on a digestible lysine and energy basis. Formulating the diet on a crude protein basis will result in a lysine deficiency and possible a deficiency of other amino acids, such as tryptophan, methionine or threonine, which will reduce growth performance.

Growth Performance

It has been known for decades that distillers byproducts can be used in nursery, grow-finish, and the reproducing female diets. Distillers dried grain with solubles (DDGS) is the major distillers byproduct used in swine diets. Several researchers reported no differences or either slight improvements in growth and feed efficiency of young pigs fed low concentrations (2.5 to 5 % of distillers dried grains with solubles (DDGS). The use of distillers dried grain with solubles (DDGS) in grow-finish diets has been limited no

more than 20 % inclusion rates. It is more common to limit the inclusion rate to 10 % in grow-finish diets (Table 1). When formulating grow-finish diets to have a 20 % inclusion rate of DDGS then synthetic lysine and tryptophan should be used to maintain an amino acid balanced diet. The breeding herd diet is probably the best place to use DDGS with a maximum inclusion rate of 40 % in gestation diets. These are conservative recommendations. More recently, researchers (Senne et al. 1996) have shown that sorghum-based distillers dried grains with solubles can be included into nursery pig diets at a maximum inclusion rate of 30 % and 60 % for grow-finish diets with no detrimental effect on growth performance (Table 1 and 2). However, at these higher inclusion rates, the usage of synthetic lysine, tryptophan, methionine, and threonine will be necessary. The use of either distillers dried solubles (DDS) or distillers dried grains (DDG) in swine diets is not recommended. The quality of the protein and ratio of amino acids does not support growth performance.

Table 1. Effect of distillers dried grains on growth performance in the nursery phase. (13 lbs. at weaning).

lb/d	%, DDGS in the diet			
	0	15	30	45
Daily Gain	1.07	1.10	1.02	0.88
Daily Feed Intake	1.72	1.62	1.43	1.42
Feed Efficiency	1.61	1.47	1.39	1.63

Table 2. Effect of distillers dried grains on growth performance in the grow-finish phase. (120 to 246 lbs.).

lb/d	%, DDGS in the diet			
	0	20	40	60
Daily Gain	2.09	2.22	2.22	2.19
Daily Feed Intake	6.97	6.75	6.66	6.38
Feed Efficiency	3.34	3.04	3.00	2.91

Economics

In Table 3, the economic value of distillers dried grains with solubles in grow-finish diets is shown and the assumption is made that the diets are formulated to contain only a 10% inclusion rate of DDGS. If a 20 % inclusion rate is used, you may assume a 3 % reduction in growth performance, thus making the DDGS value to decrease by $24/ton.

Table 3. Economic value of distillers dried grains with solubles in grow-finish pig diets.(Assuming a 10 % inclusion rate)				
Corn Price($/bushel)	**Soybean meal price ($/ton)**			
	150	**200**	**250**	**300**
2.00	81	84	87	89
2.50	98	100	103	106
3.00	114	117	120	123
3.50	131	134	137	139
4.00	148	150	153	156

Conclusion

In conclusion, distillers dried grain with solubles can be efficiently used in swine diets; however, dietary formulations should be evaluated before implemented by a nutritionist to ensure growth performance is maintained. The distillers grain should be analyzed before formulation because considerable variation between sources may exist. Distillers byproducts do have a distinct "malt" odor and a bitter taste. High inclusion rates above the ideal recommendation of 5 % for nursery, 10 % for grow-finish, and 40 % for gestation diets may cause feed refusal and necessitate the addition of a flavor or masking agent to the feed. Also, at the higher inclusion rates, the supplementation of several synthetic amino acids will increase the total dietary cost.