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Swine News

Nutrifax – Corn Distillers Dried Grains with solubles – Use in Swine Rations

Included in your mail this week is a Nutrifax article written by Dr. Andrew Pharazyn dealing with Corn Distillers Dried Grains with Solubles (CDDGs) and the benefits of using this ingredient as an alternative to corn. There has been some interest in this ingredient since the news on several new ethanol plants in Ontario and the US. The production, quality issues and recommended feeding guidelines associated with the use of CDDGs are covered.

If additional copies are needed they can be obtained by contacting Sharron Jackson in the Sales Promotion Department.

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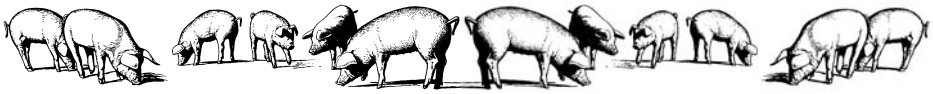
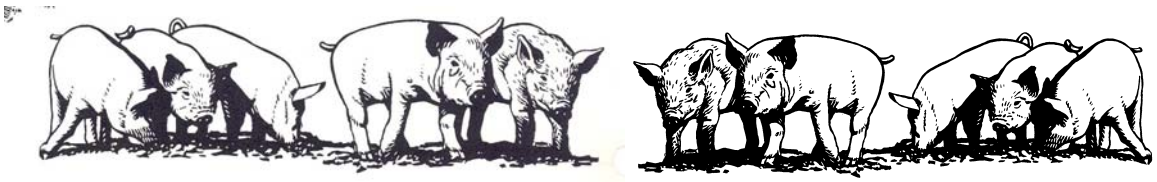
NUTRIFAX

Nutrition News and Information Update



Corn Distillers Dried Grains in Swine Feeds



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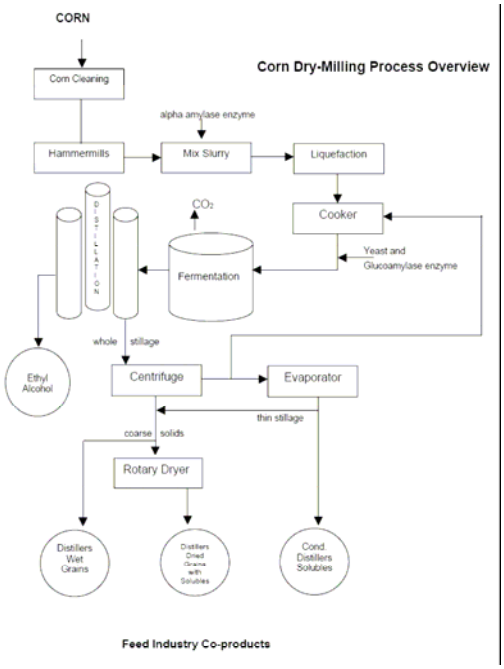
Corn Distillers Dried Grains with solubles (CDDGs) is a byproduct of the ethanol industry. As commercial production of ethanol increases, the supply of corn distillers dried grains with solubles will increase. Conversely, the supply of corn diverted to ethanol production will rise, increasing the bushel price of corn. The Suncor facility in Sarnia is expected to begin production in July 2006, with an annual ethanol production of 200 million litres and producing 450 to 500 tonnes per day of dry distillers grains into the Ontario market. Similarly, Commercial Alcohols produces 187 million litres per year out of the Chatham facility.

Production



In the production of ethanol, corn is cleaned of foreign material and then ground to a medium-coarse grind through a hammer mill. The corn is mixed with fresh and recycled water to form a slurry. The pH and temperature are adjusted and enzymes added to facilitate the breakdown of starch to dextrins or long chain sugars, in a process known as liquefaction. A second enzyme is added to take this down to simple sugars. A yeast, *Saccharomyces cerevisiae* is used to convert the simple sugars to ethanol and carbon dioxide. Fermentation is completed within 40 to 60 hours. The ethanol is then removed. The coarse solids are separated from the stillage. The thin stillage is recycled to the beginning of the process or concentrated as distillers solubles which is then added back to the coarse solids and the mixture dried to form the co-product Corn Distillers Dried Grains. The water content of the solubles added may vary and require a longer drying time and higher temperatures. This step is one of the key determinants in quality of CDDGs for swine.

Ingredient Quality

Corn Distillers Dried Grains with solubles has traditionally been used as a feed ingredient in dairy diets. However, there has been research conducted on the suitability of using CDDGs in swine diets. The production of ethanol removes the starch component of corn therefore removing the major energy component of corn.

The quality of Corn Distillers Dried Grains with solubles depends on a number of factors. These are:

1. Corn quality – protein content, bushel weight, vomitoxin levels
2. Yeast used
3. Fermentation and distillation efficiency
4. Drying time and temperatures
5. Amount of solubles blended with dry material
6. Facility type – batch (modern) versus continuous (older)

Consistency in the process is the biggest driver in the variability in nutrient composition and availability.

Rather than using a static value, ShurGain dynamically predicts the energy content of CDDGs based on the proximate analysis of the ingredient. The older estimates of energy content are based on the CDDGs with lower fat contents and higher fibre levels, The CDDGs from newer ethanol plants have higher fat content and higher energy content than normally specified for CDDGs.

The protein content of CDDGs is high (>27%). However, like corn, the balance of amino acids is poor, being low in lysine and tryptophan in comparison to other protein sources such as soyabean meal. The other concern is the variability in amino acid availability. Like all heat-processed products, the drying process used can reduce lysine availability, decreasing the quantity of this essential amino acid actually available to the pig.

A recent paper from the South Dakota State University determined the availability of amino acids from several newer ethanol plants. Over the 10 samples, lysine availability ranged from 44% to 63% while other amino acids showed a lower range in availability. Drying temperatures can vary from batch to batch. Under high temperatures, lysine in the protein can form complexes with sugars (called a Maillard or “Browning” reaction, that reduce the availability of lysine in the CDDGs. This is a similar process that occurs in corn that has been subjected to high drying temperatures. Heat damaged product is normally darker coloured.

The colour of CDDGs appears to be a good indicator of amino acid availability with a close relationship between colour and amino acid availability. Colour is dependent on the processing parameters of the ethanol plant with darker colour product associated with poorer quality and indicative of heat damage.

CDDGs have a high oil content. This oil has a high proportion of polyunsaturated fat can contribute to soft carcass fat. When CDDGs exceed 10% of the diet, there is a tendency to have softer fat in the carcass. With the higher polyunsaturated fat content, it may be advisable to increase the vitamin E content of the feed.

Mycotoxins can be present in CDDGs. The removal of starch through the fermentation process concentrates the remaining nutrients by a factor of 3. If vomitoxin is present in the corn, the level in the CDDGs will be three-times that level. Typical vomitoxin levels in Ontario produced CDDGs averaged 3.0 ppm, with a range of values from 0.0 to 4.8 ppm. This restricts the level of CDDGs that can be used in swine feed.

Swine Feeding Recommendations

Gerry Shurson at the University of Minnesota has done extensive work in the use of CDDGs from modern ethanol plants in swine diets. For pigs (11 –25 kg) two experiments were reported, one where no difference in feed intake in CDDGs up to 25% while the other showed a decrease in feed intake at 10% and higher. Studies in grow-finish pigs fed CDDGs at 0, 10, 20 and 30% of the diet. A drop off in ADG was seen at levels of 20 to 30% CDDGs with the high corn oil content impacting on carcass fatty acid profile. Many of these studies were done on single batches and sources of CDDGs therefore are not reflective of the variation seen in CDDGs.

In summary, the major concern with CDDGs is the variability in nutrient composition and quality. As inclusion levels in the diet increases, CDDGs variability may have a negative impact on animal performance on the feed provided. With this in mind, our current recommendations for the use of corn distiller's dried grains with solubles are as follows:

Starter Pigs >12 kg	5% maximum inclusion in complete ration
Grow-Finish Pigs	10% maximum inclusion in complete ration
Gestating Sows	20% maximum inclusion in complete ration
Lactating Sows	10% maximum inclusion in complete ration