

Distillers Dried Grains with Solubles (DDGS) – An Effective and Available Livestock and Poultry Feed Ingredient

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After fermentation, ethanol is separated by distillation while the water and non-fermentable materials (known as whole stillage) are decanted or centrifuged which results in wet cake (e.g., removed suspended solids) and soluble solid-laden water (i.e., thin stillage). Evaporation of the thin stillage produces condensed distillers solubles (known as CDS) which can then be mixed into the wet cake, and then dried to produce a variety of coproducts. These coproducts are broadly known as “distillers grains”, and can be wet or dry, and may or may not have CDS added into the matrix.

Distillers Dried Grains with Solubles (DDGS) is the most common coproduct from many ethanol plants. It is typically dried to about 10% moisture content, to ensure a long shelf life and to reduce flowability issues during storage and transport. It can be transported by truck, rail, and boat to local livestock producers, throughout the country, or even to overseas markets. DDGS has increasingly been exported to globally in recent years.

Distillers Wet Grains (known as DWG) is popular with beef and dairy producers near ethanol plants, due to better digestibility and lower prices (because it is not dried). In fact, it has been estimated that in the U.S., up to 50% of distillers grains are sold as DWG. But, because the moisture contents are generally greater than 50 to 60%, DWG shelf life is extremely limited (less than one week, generally), especially in summer months, and shipping large quantities of water is expensive. DDGS is thus the most prevalent type of distillers coproduct in the marketplace.

Coproduct compositions will vary according to each plant and the production practices used at each. Distillers wet grains often have a moisture content of ~65%, with protein levels of 44% (d.b.), fat of 5% (d.b.), and fibre of 29% (d.b.).

As a rule of thumb, nutrients in DDGS will be concentrated by a factor of approximately 3x (except for starch) compared to the raw grain. DDGS from most fuel ethanol plants typically contains about 30% (d.b.) protein, 10% (d.b.) fat, 40% (d.b.) neutral detergent fibre, and the lower the starch content the better - as this is indicative of conversion efficiency. DDGS composition will vary somewhat amongst plants. Recent data shows that DDGS from various plants can have a range of values: moisture of 8-13%, protein of 25-34% (d.b.), fat of 7-16% (d.b.), and fibre (as neutral detergent fibre) of 18-47% (d.b.). Additionally, DDGS will contain yeast proteins, which can have a probiotic effect in livestock.

In recent years, oil removal technologies have been installed in most corn ethanol plants in the U.S., and fat levels in the DDGS and DWG have been declining. Additionally, residual

starch in the coproducts has been falling as well, because the plants are continually becoming more efficient in fermentation operations.

Animal feed is the most important use for ethanol coproducts (more than 99%, in fact). Coproducts contain nutrient profiles that parallel the grain that was used for fermentation (most of the starch is used by the microbes, so the remaining nutrients are concentrated by approximately 3x), and they are highly digestible. It has been shown that DDGS can replace corn in livestock diets on a 1:1 up to a 1.2:1 level, depending on the species.

The majority of distillers grains are used in beef and dairy feeds, because ruminants can easily utilize high levels of fibre. But, monogastrics (including swine, poultry, fish, and others) have been shown to readily digest DDGS as well, and these markets continue to gain importance. Many feeding trials have been conducted on coproducts over the years, for both monogastrics and ruminants, in order to increase and optimize coproduct use.

The use of coproducts in animal feeds (as a substitute for grain) will actually help offset grain quantities used for alcohol production, and will increase the availability of protein in the marketplace. And, as feed ingredient prices have increased in recent years, coupled with increasing knowledge about how to effectively use these feed ingredients, coproduct use in swine and poultry diets are rapidly increasing.

Depending on the other ingredients used in the animal diet, all livestock species have been shown to thrive at 10% DDGS inclusion, and most can succeed at levels even greater than 20%. For beef cattle, typical inclusion rates are 30-40%; 10-30% for dairy cows; 20-50% for market swine; and 10-15% for poultry (layers, broilers, and turkeys). However, inclusion rates are often based on the price of DDGS vs. other ingredients, especially corn (maize) and soybean meal. It is important, however, to work with a livestock or poultry nutritionist to make sure that you optimally use DDGS in your feed rations.



Figure 1. Distillers Dried Grains with Solubles (DDGS) is the most common coproduct available from fuel ethanol plants.



Figure 2. Distillers Wet Grains (DWG) is another common coproduct available from fuel ethanol plants.

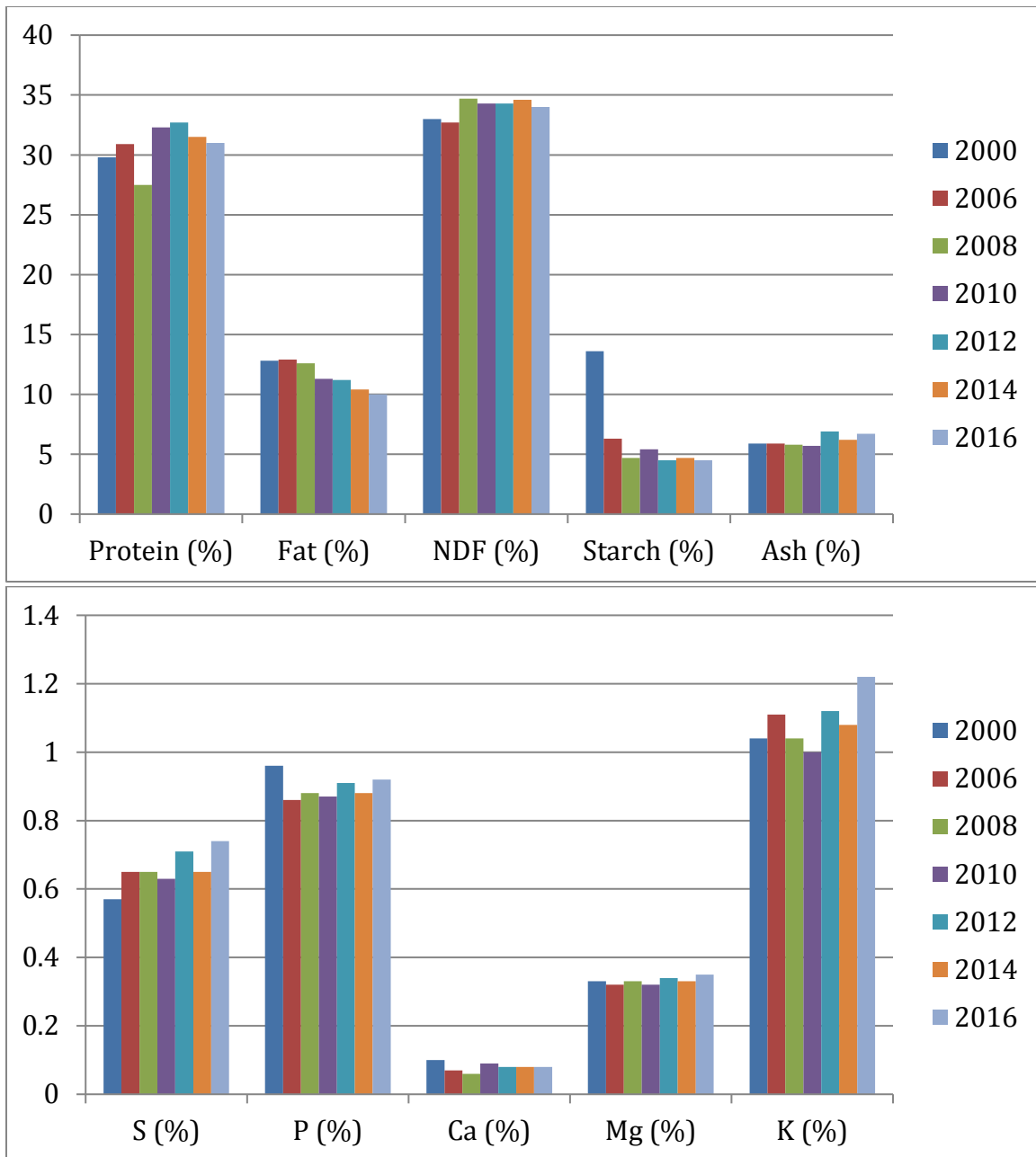


Figure 3. Processing efficiencies have improved, new technologies have been implemented, oil separation systems have been installed, and the composition of DDGS has evolved over time.