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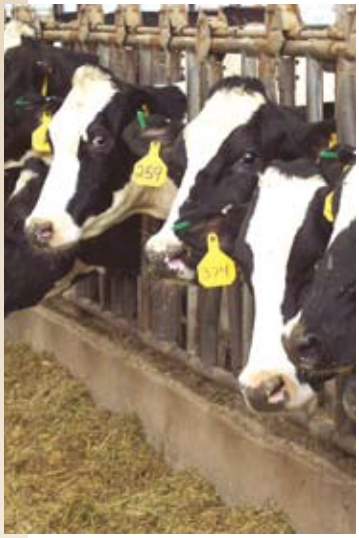
ID-332-W

BioEnergy

Fueling America Through Renewable Resources

Value of Distillers' Grain Ethanol Co-Products to Dairy Replacements



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EXPERT REVIEWED

Introduction

Feeding the co-products remaining from corn after the production of fuel grade ethanol offers an opportunity for adding further value to the corn grown in Indiana. Dairy heifer growers feeding replacements from 3 to 24 months of age can efficiently use dry or wet distillers' grains as a low-cost source of protein, energy, phosphorus, and other nutrients.

Distillers' grains and the soluble fraction that remains after the production of ethanol are typically mixed, dried, and sold as dried distillers' grains with solubles (DDGS). This commodity varies in nutrient content among batches and between sources due to variations in drying temperatures and processing times (Table 1) .

In one study, calves as young as 13 weeks of age were fed 5 lbs grain mix composed of 50% corn and 50% DDGS along with free choice hay. Calves fed DDGS maintained equal weight gain and health status when compared to calves fed grain mix composed of ground corn and soybean meal. For older heifers, the ration can contain even greater than 50% DDGS or wet DGS. Research at several universities has demonstrated that weight gains of 1.9 to 2.2 lbs/day for heifers weighing between 400 and 1000 lbs are possible when DG are feed along with a suitable fiber source.

Storage and Handling Concerns

One of the problems encountered in using wet distillers' grain (WDGS) is the limited storage window and problems in handling the wet material. Wet DGS is delivered at 70% moisture in 20 ton "walker" trucks with a central unloader somewhat like a traditional solid manure spreader.

Research done by scientists at other universities shows that wet distillers grain (WDGS) delivered every 7 days from a local distillery is a viable option for heifer rations

Table 1. *Range in Nutrient Composition of Distillers' Grains plus Solubles*[1]

Item	% of DM
Crude protein	28 to 36
RUP, % of CP [2]	47 to 63
NEg, Mcal/lb [2]	1.0 to 1.2
Fat	8.2 to 11.7
Acid detergent fiber	19 to 24
Neutral detergent fiber	38 to 44
Calcium	0.10 to 0.15
Phosphorus	0.43 to 0.83

[1] D.K. Schingoethe, South Dakota State University, 2002.
[2] Ruminally undegradable protein, NRC, 2001.

Photo courtesy of Kimberlee Schoonmaker, Dairy Herd Management Magazine, June, 2006

Figure 1. *Wet Distillers' Grains with Solubles Mixed with Chopped Corn Stalks on a 2/3:1/3 Basis*

when it is mixed with chopped corn stalks, straw, or other fibrous feeds as a total mixed ration (TMR) (Figure 1).

On smaller heifer-raising operations, long-term storage is required, and ensiling WDGS in large plastic "Ag-Bag" silos is a viable opportunity that can allow producers to purchase several 20-ton loads of WDGS at a time of the year when corn stalks or straw is readily available. These bag silos are commonly used by dairymen in Indiana to store either corn or hay silages, high moisture corn, or other commodities (Figure 2). Research from South Dakota shows that silage containing 2/3 wet DGS and 1/3 chopped fibrous feed (either corn stalks or straw) can support 2.0 to 2.5 pounds of daily gain in dairy replacement heifers of 500 to 1000 lbs body weight, which is comparable to gains obtained from heifers fed control rations containing corn silage, corn, soybean meal, and hay.

Photo courtesy of Dr. Ken Kalscheur, SDSU

Figure 2. *Distillers' Grains Can Be Ensiled in Plastic Bags.*

The initial pH of wet DGS is very acidic so that little fermentation occurs once the material is stored in the bag silo. However, when bags are opened and the mixture of wet distillers' and the chopped fibrous feed is exposed to air, spoilage occurs so that at least 6 to 8 inches silage depth must be removed daily to avoid reduced feed quality and losses. Chopping of stalks or straw (1″ to 2″ length) with a flail chopper and good distribution of the fibrous additive and wet DGS are critical, wide lane width between bag silos is required (twice as wide as for corn silage), and a firm, well-drained base of crushed gravel topped with sand is needed to make this system work.

Conclusion

For this low-cost feeding strategy to be practical, the ration fed must meet three requirements. The ration must: 1) Be formulated to meet, and not greatly exceed, nutritional requirements, therefore permitting growth but not fattening, 2) Be tested for nutrient content prior to feeding, and 3) Be tested for mycotoxins like aflatoxin or zearalenone. The latter is critical because the removal of the corn starch in the production of ethanol may concentrate mycotoxins by three fold relative to levels in corn grain.

Factors that may limit the use of wet or dry distillers' grains for dairy young stock are the distance and cost of hauling the product from the ethanol plant, timeliness of delivery, and availability of suitable fibrous co-ensiling feeds.

As producers make the final decision about the use of DDGS and other co-products from ethanol distillation, the potentially large feed cost saving must be weighed against the risks of use of this co-product of the ethanol industry. New distillers' grain fractionation techniques and fermentation technologies may offer further opportunities for use of wet DG or DDGS resulting from ethanol production. Good co-product storage techniques and proper ration balancing and formulation will be required to allow the best use of the available co-products from the ethanol industry.

References and Further Information

Feeding Bio-Fuel Co-Products to Livestock. Purdue University Cooperative Extension Service. <http://www.ansc.purdue.edu/biofuel/> (2006).

Garcia, A. D.; K. F. Kalscheur. "Ensiling Wet Distillers' Grains with Other Feeds," ExEx 4029. South Dakota State University Cooperative Extension Service. <http://agbiopubs.sdstate.edu/articles/ExEx4029.pdf> (2004).

Kalscheur, K .F.; Garcia, A. D. "Use of By-Products in Growing Dairy Heifer Diets." ExEx 4030. South Dakota State University Cooperative Extension Service. <http://agbiopubs.sdstate.edu/articles/ExEx4030.pdf> (2004).

Lemenager et al. "The Value of Distillers' Grains as a Livestock Feed." ID-330. Purdue University Cooperative Extension Service. (2006).

NRC Nutrient of Dairy Cattle. 7th rev. ed. National Acad. Sci. Washington DC. (2001).

Schingoethe, D. J. Distillers Grains for Dairy Cattle." ExEx 4022. South Dakota State University Cooperative Extension Service. <http://agbiopubs.sdstate.edu/articles/ExEx4030.pdf> (2002).

Schingothe, D. J. "Can We Feed More Distillers' Grains?" Pg. 71-78 In: *Proceedings of Tri-State Dairy Nutrition Conference, Fort Wayne, IN*. <http://tristatedairy.osu.edu> (2006).

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