6-1-2003

Using Co-Products from the Corn Milling Industry in Sheep Rations

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Abstract
Over the last 18 months, the State of Iowa has experienced an explosion in the corn milling industry. The majority of this activity is with cooperatively owned and operated small to medium sized ethanol plants. The most important factor when evaluating co-products for use in sheep rations is what specific product one is considering using.

Disciplines
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Over the last 18 months, the State of Iowa has experienced an explosion in the corn milling industry. The majority of this activity is with cooperatively owned and operated small to medium sized ethanol plants. The most important factor when evaluating co-products for use in sheep rations is what specific product one is considering using. Two excellent reference pieces are located on the Iowa Beef Center web page: www.extension.iastate.edu/Publications/IBC18.pdf and www.extension.iastate.edu/Publications/IBC19.pdf Even though these are oriented primarily to cattle, the information is useful for sheep nutrition, especially IBC 18 as it explains the dry corn milling process and the co-products produced.

The main products from the ethanol plants are wet distillers grains (WDG), dried distillers grains (DDG), and dried distillers grains with solubles (DDGS). Higher moisture products include the stillage and condensed distillers solubles (CDS). To get ethanol produced during the milling process, ground corn is fermented with yeast. Yeast converts the starch into alcohol leaving a protein dense co-product ranging from 24 to 32% crude protein. As one reviews the research in cattle finishing trials, the energy value of these by-products varies from 90-120% of corn.

In most situations, wet distillers grains have higher energy values than dried corn co-products. Additionally, one observes greater benefits when co-products compose 5-10 percent of ration compared to diets containing 20-40% co-product. Researchers are not exactly sure but think this may be due to escape protein value improving the protein status of the animal resulting in superior performance or to improved rumen fermentation which results in better utilization of the feedstuffs.

Limited research has been conducted with sheep. Don Ely at the University of Kentucky compared DDGS to soybean meal as protein source for lactating ewes. No performance differences were observed for lamb gain or milk production. First year results from the ISU McNay Research farm with DDGS versus corn did not improve milk production or lamb gains, indicating that alfalfa hay based lactation rations do not require escape protein. In personal communication with Don Ely, they include 5-10% DDGS in their lamb finishing rations. Gain responses are observed from increased intakes and possibly escape protein that increases the protein available to the lamb. One precaution with lamb finishing rations is that calcium:phosphorous ratios need to be closely monitored to prevent urinary calculi since distillers' grains are high in phosphorous and low in calcium.

Co-product feeds from the dry corn milling industry are most useful with low quality forages. For example, diets composed of corn stover and DDGS would be extremely economical for ewes in early and mid gestation. When protein is needed in the ration corn co-products should be compared to soybean meal on a per pound of protein provided. With high quality feedstuffs like alfalfa or alfalfa grass hays, corn co-products are being used primarily for energy and need to be evaluated against corn as an energy source. One major concern when evaluating costs is that differences in dry matter content need to be taken into account. From Table 1, wet distillers grains are from

30-50% dry mater and 70-50% water, whereas dried distillers is 90% dry matter. So, if we adjust for water, one can pay half the price for wet distillers as dry distillers. We may buy high priced water for ourselves, but generally purchasing water for sheep is not an economical choice.

Some producers located close to plants have ready access to stillage. In the beef center papers, some cattle feeding trials have used this stillage as the only water source. Free choicing these products to ewe flocks have resulted in over consumption and digestive disorders (Larry Holler, personal communication). Polioencephalomia (brainers) is the most severe response from over consumption. Over fat ewes and dystocia could be another negative consequence of ad libitum intake. Polios (brainers) can also occur due to excess sulfur intake, which has been a reported problem with corn gluten feed in dairy cows and feedlot cattle and is possible with distillers.

Copper levels seem to be quite variable and may be dependent on the copper content of the stills. Values range from 6 ppm in wet distillers to 83 ppm in the condensed distillers solubles. Care must be exercised to prevent the accumulation of copper to toxic levels over time. Since a small portion of ewe diets will be co-products, copper problems are minimized. One step to help prevent copper problems is to feed a sheep mineral with molybdenum to reduce copper intake. The higher sulfur level in distiller's products also reduces copper absorption.

Table 2 provides example rations that make the best use of corn co-products in ewe rations. Table 3 contains rations that use DDGS in lamb finishing rations. Co-product feeds are excellent sources of nutrients. Competition for these products is currently very high so great buys do not happen very often. As Iowa proceeds ahead with more plants coming online the volume of by-products may out run demand and then good buys might become common place.

Table 1. Composition of by-products and common feedstuffs[ab].

Ingredient	%DM	%CP	%TDN	%Ca	%P
Corn	88	8.0	77	.02	.30
SBM	89	44	78	.30	.70
Alfalfa Hay	87	16-18	51-56	1.3	.31
Products from wet milling					
Dry corn gluten feed	90	18	72	.05	1.0
Corn gluten meal	90	60	77	.07	.48
Condensed steep water solubles	50	17.5	45	.03	1.0
Products from dry milling					
Distillers dried grains w/ solubles	90	26	78.8	.19	.72
Distillers dried grains	90	27	69.3	.09	.37
Condensed distillers solubles	30-50	8	29.4	.03	.41

[a] Nutrient values are on an **as fed basis**.

[b] DM=dry matter, CP=crude protein, TDN=total digestible nutrients, Ca=calcium and P=phosphorous.Table 2. Example daily rations for 175-pound ewes in various stages of production.

	Corn Stover	Corn Silage	DDGS	Lime-stone	Dicalcium phosphate
Early gestation	2.0		.6		
		4	.5	.01	
Late gestation (twins)	3.5		1.2		
		7	1.0	.03	
Lactation (singles)	3.5		1.6		.02
		5	1.5	.04	
Lactation (twins)	4.0		2.5		.02
		5	2.5	.05	

Table 3. Rations for finishing lambs using dried distillers grains with solubles (DDGS).

	50-70 pounds		80-100 pounds		> 115 pounds	
Growth rate	Mod	High	Mod	High	Mod	High
Corn	1765	1345	1720	1630	1800	1725
DDGS	200	300	80	160		75
Protein supplement	325	345	180	190	180	180
Limestone	10	10	20	20	20	20
Nutrient Density (DMB)						
Crude protein %	15.4	16.7	11.9	12.9	11.1	11.9
TDN[a] %	84.1	84.3	84.6	85.0	84.2	84.6
Calcium %	.74	.78	.68	.67	.69	.68
Phosphorous %	.47	.50	.41	.43	.39	.41

[a] TDN is total digestible nutrients