Proceedings, The Range Beef Cow Symposium XIX
December 6, 7 and 8, 2005, Rapid City, South Dakota

DISTILLERS GRAINS FOR RANGE CATTLE

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Corn by-products are becoming more available in range country as more corn is used for ethanol and other products. Ethanol plants have increased dramatically in the past five years and many more plants are being planned and are going into production each year. Many of the plants are being constructed in areas where corn production is very high and yet large numbers of cattle are fed in relative close proximity of the corn processing plants. Because of the cost of drying it is more economical to feed the by-product wet, however because of limited cattle in close proximity of the plants plus often feedlots have fewer cattle on feed during the summer, it is necessary to dry the by-products and this becomes available in range country as a commodity. In most range country winter forage is low in protein which needs supplemented and often times energy supplementation is needed also. Because corn by-products are relatively high in both protein, energy and phosphorus it makes an ideal range supplement. Also because all of the starch has been removed, negative effect on forage digestion is not lowered as is the case when grain supplements, that are high in starch, are fed with low quality high roughage rations.

There are two primary types of corn milling processes where by-products are available and they are quite different products. A process that is referred to, as "dry milling" is what the ethanol industry uses and the largest by-product is distillers grains or distillers grains plus solubles. The other less common process is referred to as "wet milling" and produces corn syrup, oil and starch. The by-product form the wet milling plants that interests most cattlemen is corn gluten feed. The corn gluten feed usually contains the corn bran and the solubles or "steep" and sometimes some high protein gluten depending on the processing plant.

The process differences makes the corn gluten feed variable from plant to plant and perhaps season to season in the same plant, therefore it is important to evaluate the analysis in purchasing and feeding. A schematic drawing of the process can be seen in Figure 1 and 2 that will aid in the understanding of the dry and wet milling processes. The reason of the above discussion is to point out that the processing of the corn by-products need to be taken into consideration when pricing and feeding.

Average analysis of the byproducts is shown in Table 1. In general, about 1/3 of the dry matter of corn remains as feed products after the starch is removed for alcohol production. In other words corn is approximately two thirds starch and nearly 100% of that is removed in the fermentation process so nutrients such as protein, fat and minerals triple in the by-products. The wet milling process is more complex as more nutrients are extracted for human consumption or other uses. For example, the fat is extracted for corn oil thus the corn gluten feed is usually lower in energy than distillers grains. Also the

protein in the germ is extracted as corn gluten meal, a high protein feed that contains high quality protein that is high in bypass or undegradable intake protein (UIP). This product is usually marketed to swine, poultry or pet food industry so corn gluten feed that is available in range country is usually lower in UIP or bypass protein than corn distillers grains.

Even though not in the scope of the paper considerable research has been conducted with feeding distillers grains to growing and finishing cattle. A summary by Klopfenstein and Erickson from UNL found the energy value to be 120-150% the value of corn in finishing diets. These higher values are somewhat due to the increased energy value from the higher level of fat plus less rumen stress from acidosis, which may not be a factor in range cattle. Their summary found the energy value of distillers grain in forage rations would be 120-127% of that of dry rolled corn. Corn gluten feed appeared to have 100-108% the value of corn in finishing diets.

CORN BYPRODUCTS IN SUPPLEMENTING CATTLE ON HIGH ROUGHAGE DIETS

Corn by-products can fit in almost any diet in growing cattle, developing heifers and cow diets. They can serve as excellent sources of protein, energy and phosphorus. When fed in high roughage diets they do not appear to lower forage digestibility, as is the case when feeds that are high in starch such as corn and barley are fed. Because of the lack of negative associative effects on forage digestibility higher levels can be fed when more energy is needed or when supplements are used for a substitute of forage. This was an important consideration when many producers were in a drought situation.

Distillers grains are an excellent source of UIP or bypass protein. The importance of this will depend on the type of cattle fed and other ration components. In some cases with lactating two-year old heifers some research has indicated an improvement in rebreeding performance when the UIP requirements are met. In a large study on a Nebraska ranch a large number of heifers were fed some harvested hay and a conventional protein supplement while a second group grazed winter forage and supplemented with corn gluten feed. Little differences were noted in the heifers gain or breeding performance, however the grazed heifers with corn gluten feed had $6.71/head less development cost. Some questions have been raised if degradable intake protein (DIP) requirements must be met when high levels of distillers grain is fed that is relative high in UIP and low in DIP. When UIP is in excess the metabolizable protein will usually be in excess. It appears a portion of this excess metabolizable protein is recycled to the rumen in the form of urea to meet the DIP requirement and therefore sources of DIP such as urea will not need to be added to the supplement.

The main reason corn byproducts have increased in popularity is they are often priced very competitive with other supplements especially during the summer months when cattle numbers in feedlots are lower than in fall and winter. One of the major problems with the dry commodity products coming from the processing plants is that they are in either meal form or in some cases, a relatively soft, small pellet. The qualities

of the corn by-products is such that it is very difficult to make a quality range cube so the feed industry must add other feed ingredients such as sunflower meal or wheat mids and this increases the cost.

Some producers feed the pellets on the ground and report a very small loss. Some producers that feed the meal on the ground feel that even though some waste is experienced it is not great enough to offset the added cost of cubing. Unfortunately there is no data to accurately estimate the loss when either pellets or meal is fed on the ground. Obviously the level of waste would depend greatly on the condition of the ground, i.e. mud, softness height of grass, etc. Some producers feed in bunks, which of course eliminate waste but the cost and management of bunks must be considered. Calculations by one producer felt he could pay for bunks in less than 5 years through the savings of purchasing the byproducts directly from the processing plant.

Klopfenstein and others at UNL have compared feeding distillers dried grains and corn gluten feed either daily or an equivalent amount three times a week. In general gain was improved slightly when fed daily however feed efficiency was not affected.

In summary, corn by-products can be quite variable depending on their source but offer an excellent source of desirable supplemental nutrients, especially energy, protein and phosphorus. Because of the tremendous growth in the ethanol industry more byproducts will be available in the future and at times can be a very economical source of supplements. They offer the advantage of high energy that can be fed at relatively high levels without adversely affecting forage digestibility. They may have some advantage in bypass protein that may show some advantages in some cattle rations.

Table 1. Nutrient composition of selected corn milling byproducts.

Feedstuff:[a]	DRC[b]	WCGF-A	WCGF-B	DDGS[c]	WDGS[c]	CCDS[c]	MWDGS	Steep[d]
DM	90	44.7	60.0	90.4	34.9	35.5	45-50	49.4(49.0)[e]
CP, % of DM	9.8	19.5	24.0	33.9	31.0	23.8	NA	35.1
UIP, % of CP	60	20	20	65	65	65	NA	20
P, % of DM	0.32	0.66	0.99	0.51	0.84	1.72	NA	1.92
TDN, %	90.0	90.0	94.5	101	112	112	NA	113
NEg, Mcal/lb	0.70	0.70	0.74	0.78	0.87	0.87	NA	0.88

[a]DRC=dry rolled corn with NRC (1996) values, WCGF=wet corn gluten feed from two plants, DDGS=dried distillers grains + solubles, WDGS=wet distillers grains + solubles, CCDS=condensed corn distillers solubles (corn syrup), MWDGS=modified wet distillers grains + solubles, steep is steep liquor from wet milling plants.

[b]DRC values based on NRC (1996) values with approximately 3500 samples

[c]Values are from spring, 2003 from only one plant in Nebraska that produces DDGS, WDGS, and CCDS with standard deviation based on weekly composites.

[d]DM values represent variation from daily composites for a 60-d period. Other nutrients are based on monthly composites for 2002 and half of 2003.

[e]Values in parentheses are monthly composites for 2003 from one plant in Nebraska, with assumptions that it is a mixture of steep and distillers solubles.

Figure 1. Schematic of the dry milling industry with the feed products produced.

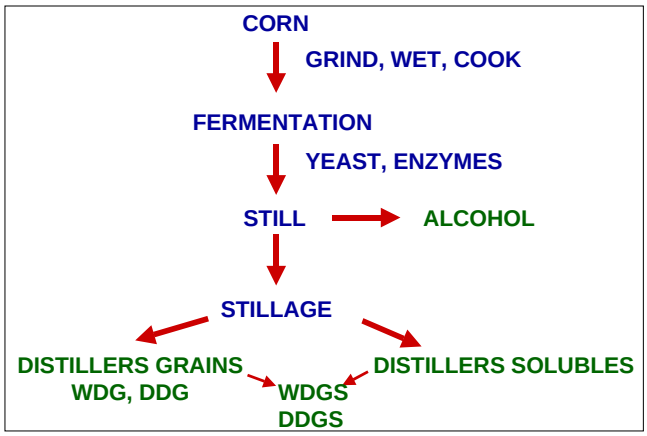

Figure 2. Schematic of the wet milling industry resulting in wet or dry corn gluten feed.