Ridin' Herd

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Don't spill the solubles

The ethanol industry continues to develop in many areas of the United States, especially in the North-Central states. The Census of Agriculture map that denotes current ethanol plants, new constructions and proposed ethanol plants changes often, with new locations being added almost weekly it seems.

Confusing terminology

The majority of the corn byproduct produced in the production of ethanol is used in feedlot cattle diets. It has been estimated that when distillers' grains are included in the diet for feedlot cattle, 15%-20% of the diet is some form of distillers' grains.

With the number of ethanol plants coming online and the projected number of new plants, there will be increasing opportunities for cow-calf producers to use grain byproducts from the ethanol industry in diets for beef cows and developing replacement heifers.

'Syrup' and 'solubles' from an ethanol plant are one and the same.

Recently, I have received a number of questions regarding feeding the liquid syrup produced by ethanol plants. The different names given to byproducts produced by ethanol plants is a source of confusion. As an example, I get questions from producers about feeding the "syrup" that they can get from an ethanol plant. I then proceed to answer the question, but instead of calling it syrup, I call it solubles.

After I get done with the answer, the person on the other end of the line says, "My question was in regard to syrup." I then proceed to explain that syrup and solubles from an ethanol plant are one and the same.

Corn condensed distillers' solubles

Corn condensed distillers' solubles are a byproduct of the ethanol production process. They are also known in the industry as "corn syrup." This liquid byproduct contains fermentation byproducts, spent yeast cells and other nutrients that remain after corn grain has been fermented to produce ethanol.

Generally, corn condensed distillers' solubles are added back to the coarse grains during the process to produce wet or dry distillers' grains with solubles. Following is the process at the plant.

At the plant there are two streams — the liquid stream (solubles) and the grain stream (distillers' grains). Usually, the grain stream is dried to a certain extent, and the liquid (solubles) is added back. When the solubles are added back to the grain stream, the byproduct is called wet distillers' grains plus solubles (WDGS). However, in some cases corn condensed distillers' solubles are not added back to the grain stream and are sold as a separate byproduct.

The nutrient content of corn condensed distillers' solubles varies from plant to plant and from day to day within a plant. Moisture content ranges from 55% to 80%. Levels of other nutrients also vary considerably. On a dry basis, crude protein (CP) ranges from 20% to 30%. Levels of phosphorus (P), potassium (K) and sulfur (S) are also variable and are greater in the solubles compared to the WDGS.

Sulfur level is of particular concern because high sulfur levels have been implicated in increased incidence of polioencephalomalacia (brainers) in cattle. In addition, corn condensed distillers' solubles contain moderate levels of fat, which gives the product energy values greater than corn on a dry basis. The fat content of WDGS is in the 10%-12% range; whereas, condensed distillers' solubles contain 20%-22% fat.

Nutrient analysis of solubles

Table 1 is a nutrient analysis of solubles on a dry-matter (DM) basis from an ethanol plant. These solubles are 70% water (30% DM). The protein content is 25.4%, which makes solubles a good protein source. The fat content is 20%. Solubles are at least two times higher in phosphorus than WDGS and, therefore, an excellent phosphorus source.

When feeding solubles, supplementing phosphorus is not needed; depending on what class of livestock is being fed, it may be necessary to supplement calcium (Ca). The chemical analysis of solubles indicates that total digestible nutrients (TDN) is 92%. Because of the way TDN is measured, it does not do a good job determining TDN content of feeds that are high in fat. Our data suggest WDGS is 120%-125% the energy value of corn grain. The TDN content of solubles would be greater than this.

Feeding solubles to beef cows

We have experimented with feeding solubles to beef cows. Based on this byproduct's nutrient analysis, it appears to be an excellent source of protein and energy for cattle grazing or consuming medium- to low-quality forages, especially in the winter for spring-calving cows.

The key would be to manage around the high sulfur and fat in the solubles. Because of the high fuel costs, we looked at how a producer might limit-feed solubles in a self-feeding situation. The reason for looking at a limiter to regulate intake is because of the high sulfur content in the solubles and the possibility of "brainers" if cattle overconsume sulfur. The maximum tolerable level of sulfur is 0.4% of the diet on a DM basis.

The problem we experienced trying to self-limit solubles to beef cows is that the solubles were too palatable, and we could not regulate intake using high levels of salt. Our goal was to self-limit intake to 3-4 pounds (lb.) of solubles per head per day on a DM basis. At more than 20% salt in the solubles, intake was limited to 4.5-5.5 lb. per head per day. At these levels, salt consumption is much higher than what I would recommend, and we would need to add even more salt to get intake to our targeted range.

Handling solubles at the farm or ranch

Corn condensed distillers' solubles are usually delivered in a tanker and are hot or warm and flow well. As the outside temperature decreases, the flowability of solubles decreases. Liquid handling equipment (tanks, pumps, hoses) is needed in order to handle this byproduct.

Table 1: Nutrient composition of corn condensed distillers' solubles on a dry-matter basis

25%	CP
20%	crude fat
92%	TDN
1.35%	crude fiber
0.05%	calcium
1.57%	phosphorous
0.92%	sulfur

Solubles will freeze. Storage tanks and pumping equipment will need to be placed in a heated shop or shed or buried underground, or insulated tanks will be needed. Over time, solubles will settle, so it would be good to have a recirculating setup and pump to remix the solubles before use.

I am not sure how long solubles can be stored in the summertime.

Final thoughts

I have worked with producers to use solubles in the winter when feeding low- to medium-quality hay. Our best results so far are obtained when the product is blended with chopped forage in a mixed ration and the amount of solubles used was in the range of 15% to 20% of the diet on a DM basis.

Producers have sprayed solubles from a tank onto windrowed forages or forages that they have delivered using a bale processor. They delivered 3-4 lb. of solubles per head per day on a DM basis. Solubles do not flow well from spraying equipment, especially in the winter. We and other producers have adapted the spraying/delivery equipment so air pressure can be applied and solubles are "forced" out. This works well.

I would not allow cows unlimited access to solubles because of the high sulfur content.

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Editor's Note: *"Ridin' Herd" is a monthly column written by Rick Rasby, professor of animal science at the University of Nebraska. The column focuses on beef nutrition and its effects on performance and profitability.*