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Dairy Update

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FEEDING DRY CORN SILAGE

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What to expect with dry corn silage!

Preservation Compromises:

- Poor Packing: Corn silage ensiled dry (> 38% DM) will not pack dense enough to result in an optimum anaerobic environment. Therefore, the silage will have an extended period of heating after ensiling. Aerobic bacteria will grow off of the nutrients in the silage resulting in a reduction in nutrient content and availability to animals.

- Mold Growth: Fungi grow in an aerobic environment. Molds are produced by fungi and therefore, if oxygen is not excluded, molds will be produced. The most common molds in corn silage are fusarium and mucor. Fusarium fungi produce molds that are reddish-pink and when fed result in reduced intake and production. Fusarium molds can produce the mycotoxin DON or vomitoxin. Mucor molds are white-gray or white-yellow and are generally not harmful but reduce nutrient content of silage and may decrease intake.

Nutrient Compromises:

- Digestibility: Corn silage is harvested based on plant moisture and kernel milkline. Both of these measures are indicators of maturity. Corn plants begin to dry as full plant maturity is reached meaning fiber digestibility decreases. In addition, as corn kernels mature, the starch within the kernel goes from a soft, milky consistency to a hard, solid starch. Therefore, as the DM content of whole corn plants increase above 35%, fiber digestibility decreases and kernels become hard reducing starch digestibility and availability, resulting in an overall reduction in DM digestibility. Research from the University of Wisconsin-Madison has shown reducing corn silage moisture from 70 to 58% resulted in a 46% reduction in ADF digestibility and a 6.8% reduction in starch digestibility (Table 1). In a second study, cows were fed corn silage harvested at 48.1 64.3, or 71.3%, whole plant moisture. Cows fed the silage harvested at 48.1% moisture were less efficient than cows fed the other silages 0.65, 0.66, or 0.68 lb of DM/lb of milk produced, respectively.

Table 1. Nutrient composition and digestibility of corn silage harvested at four stages of maturity (Bal et al., 1997a).

	Stage of Kernel Maturity			
	Early Development	1/4 Milkline	2/3 Milkline	Black Layer
Whole Plant Moisture, %	70.0	68.0	65.0	58.0
	----------% of DM----------			
NDF, %	52.0	44.4	40.5	41.3
Starch, %	18.2	28.7	37.2	37.4
In Vivo Digestibility				
ADF, %	45.7	38.3	33.6	29.4
Starch, %	94.1	92.9	92.2	87.7

Processing and Nutrient Value:

Research from the University of Wisconsin-Madison looked at the effect of processing on immature or mature corn silage (Table 2). Processing improved rumen digestibility of DM, NDF, and starch over unprocessed corn silage harvested immature or mature. However, processing mature corn silage did not improve rumen digestibility of DM, NDF, or starch to be equal to processed immature corn silage. Therefore, processing a mature corn silage will improve rumen digestibility compared with unprocessed, however the nutrient value of dry mature corn silage will still be compromised simply due to stage of maturity (DM) at harvest.

Table 2. Effects of unprocessed or processed, immature and mature corn silage on rumen digestibility of DM, NDF, and starch. (Bal et al., 1998b).

	Immature Corn Silage		Mature Corn Silage		Difference		
	Unprocessed	Processed	Unprocessed	Processed	Immature	Mature	Processed
	---------- % Ruminal Disappearance after 24 hr ----------				(processed-unprocessed)	(processed-unprocessed)	(mature-immature)
DM	58.1	67.1	52.4	62.2	9	9.8	-4.9
NDF	30.8	32.6	21.5	25.1	1.8	3.6	-7.5
Starch	66.4	84.4	52.5	79.0	18	26.5	-5.4

Recommendations for feeding dry corn silages:

Dry corn silage will result in reduced fiber and starch digestibility. Feeding programs must overcome or minimize the effects of nutrient loss from dry silages if production performance is to be maintained or increased. Unfortunately, there is not a single or simple solution to dry silage problems. Below are a few options:

1. The other option would be to formulate for a <u>lower level of forage NDF (< 19% Forage NDF).</u> By decreasing fiber in the diet, the rate of rumen emptying will increase. Therefore, the diet will decrease in digestibility but dry matter intake may increase. If passage rate increases and diet digestibility decreases, there will be more corn kernels and longer corn silage particles in the manure. Therefore, the corn silage will be less valuable as an energy source than when increasing

fiber in the diet. Because there is less fiber in the diet to act as a buffer in the rumen, adding high amounts of quickly digested starch is not recommended. Favorable replacement options are highly digestible fiber sources such as dry or wet corn gluten feed, soyhulls, and beet pulp. These feeds will increase the production of volatile fatty acids involved in milk fat synthesis as well as buffer the rumen. Researchers from the Ohio State University conducted a study in which corn silage was replaced with corn gluten feed (CGF; 20% of diet DM) or corn gluten feed (20% of diet DM) plus sodium bicarbonate (1% of diet DM). In situ DM, NDF, and ADF digestibility were greater for the CGF + buffer diets. Additionally, cows fed the CGF + buffer diet produced more milk and 4% fat corrected milk than cows fed the other diets. Feeding highly digestible fiber will potentially increase the rate of passage of the diet from the rumen compromising diet digestibility by increasing DMI.

2. Processing corn silage coming out of the silo is another option. Stationary processors are available for use with upright silos. Processing corn silage coming out of the silo should be considered if there are large cobs and the majority of corn kernels are dry and whole.

3. An alternative option is to formulate for a higher level of forage NDF from corn silage (≥ 20% Forage NDF). Increasing fiber content of the diet will lead to a longer retention time in the rumen and possibly a greater extent of corn silage digestibility. This means that your dry corn silage will be more valuable as an energy source but, quick energy available to the cow will be limiting unless some form of starch is added such as high moisture corn or fine ground dry corn. This option would be best if the silage is fine with no large cobs or whole kernels. Research from the University of Minnesota supports feeding up to 26% forage NDF from a leafy corn silage hybrid without compromising milk production. However, this corn silage was harvested at ½ milkline.

4. Testing for molds and mycotoxins: If tests for vomitoxin or other mycotoxins are needed, be sure the testing method is reliable and accurate for corn silages. Elisa tests for fermented feeds may yield false positives, as the test is highly sensitive to acid.

Unfortunately, ensiling dry or mature corn silage has already happened. The best option to deal with it will depend on the feedstuffs available on your farm, your ability to buy other feedstuffs and your management style.