2016 Corn Silage Crop in Ohio

Maurice Eastridge and Bill Weiss

Department of Animal Sciences
The Ohio State University

The weather conditions have been variable in Ohio this summer. Some areas have been extremely dry and other areas have been very wet during the past two to three months. Thus, corn silage yields will likely be quite variable across Ohio this year. For those areas that have been very dry, yields will be adversely affected, but generally the concentrations of protein and energy will be better than average. Therefore, many dairy farmers in Ohio may need to purchase additional corn for silage or identify other ingredients to replace corn silage in the diet. Now is the time to make such decisions while some corn may still be standing in the field, other forages are readily available, and commodities will be less expensive near harvest time.

Harvesting Corn Silage

Chop at the correct dry matter (DM) concentration. The factor primarily responsible for obtaining a good fermentation is the DM concentration of the plant when chopped. This is the same whether it is a beautiful, record breaking corn crop or a severely drought stressed field with short plants containing no ears. Chopping corn silage at the wrong DM concentration will increase fermentation losses and reduce the nutrient value of the silage. The recommended ranges for silage DM are:

Bunker: 30 to 35%	Upright: 32 to 38%
Bag: 32 to 38%	Sealed upright: 35 to 38%

Drought-stressed corn plants are often much wetter than they appear, even if the lower plant leaves are brown. Before starting to chop, sample some plants (cut at the same height as they will be with the harvester) and either analyze DM using a Koster tester or microwave or send to a commercial lab (turn-around time may be a few days if you send it to a lab). If the plants are too wet, delay chopping until the desired plant DM is reached. By delaying harvest, the plant may continue to accumulate DM (increase yield), and you will not suffer increased fermentation losses caused by ensiling corn that is too wet.

Use a proven inoculant. When silage is worth upwards of $80/ton (35% DM), reducing shrink by 2 percentage units has a value of about $2/ton. Homolactic inoculants (these are the 'standard silage inoculants') produce lactic acid which reduces fermentation losses but sometimes can increase spoilage during feedout. The *buchneri* inoculants increase acetic acid which slightly increases fermentation losses but greatly reduce spoilage during feedout. Severely drought-stressed corn can have a high concentration of sugars because the plant is not

depositing starch into the kernels. High sugar concentrations can increase spoilage at feed out because it is a food source for yeasts and molds. Use of a good (from a reputable company with research showing efficacy) *buchneri* inoculant may be especially cost-effective with drought-stressed corn.

Check for nitrates. Because of the growing season this year, the risk of nitrate accumulation is not extremely high, but you should still test silage from drought-stressed corn plants. Ideally, corn plants should be sampled and assayed for nitrates prior to chopping (most labs offer very rapid turn-around times for a nitrate assay). If values are high, raising the cutting height will reduce nitrate concentrations in the silage because the bottom of the stalk usually has the highest nitrate concentrations. However, do not raise the cutting height unless necessary to reduce nitrate concentrations because this will reduce yield. Nitrate concentrations are often reduced during silage fermentation so that high nitrates in fresh corn plants may end up as acceptable concentrations in the fermented corn silage. Silage with more than 1.5% nitrate (0.35% nitrate-N) has a high risk of causing nitrate toxicity in cattle. The yellow or brown gas you might see coming from a silo a day or two after filling is a result of the conversion of nitrates to other compounds. CAUTION - this gas is very toxic to humans and animals.

Chop at correct particle length. Do not chop the corn too finely such that the effective fiber concentration of corn silage is reduced. If the corn plants have limited ear development, fine chopping is not needed for good starch digestibility. Generally a theoretical length of cut (TLC) of about ½ inch is acceptable (longer with kernel processing and BMR silage), but this varies greatly between choppers and crop moisture concentration. If using a Penn State particle size sieve, aim for 5 to 10% on the top screen at the time of chopping.

Reduce Shrink. Fill quickly, pack adequately, cover, and seal the silo as soon as you are done chopping. Practicing good silage-making techniques can reduce shrink by more than 5 percentage units, which can be worth more than $4/ton of corn silage (35% DM).

Additional recommendations on harvesting corn silage are available on the eXtension web site in the dairy cattle section where feature articles have been posted on forages and other topics: http://articles.extension.org/pages/71253/dairexnet-feature-article-series. Delaying the feeding of the silage for about 60 days will increase the digestibility of the silage, and thus optimize animal performance from consuming the silage. If the harvest of the corn is delayed and frost occurs, frosted corn can still be a valuable feed, but you have to be careful with the rapid dry-down to harvest the silage at the proper DM.

Pricing Corn Silage

The price for corn silage depends on its nutrient composition and the price of other feed ingredients in the market. In each issue of the Buckeye Dairy News (BDN) (http://dairy.osu.edu/newsletter/buckeye-dairy-news), an article is provided that provides the predicted value of feeds based on chemical composition and current prices of commodities,

including the predicted price for corn silage. For example, in the July 2016 issue of BDN, corn silage was reported at an actual price of $46/ton but having a predicted price of $78/ton (95% confidence interval of $68 to 88/ton). Some articles are available on the OSU dairy web site for pricing standing corn for silage and for pricing drought-stressed corn for silage: http://dairy.osu.edu/resources/feeding-and-nutrition.

However the ultimate determinant of price is still supply and demand in a local market (corn silage cannot be transported long distances). If a local area has a lot of corn that is not worth harvesting for grain, the price of the standing corn may be substantially less than its nutrient value.

Dietary Replacement of Corn Silage

Corn silage is certainly a valuable ingredient in diets for dairy cattle. It is a very efficient crop to grow in Ohio, and it provides valuable energy and fiber usually at bargain prices in diets of high-producing dairy cows. Typical chemical composition of corn silage is provided in Table 1. Some strategies for stretching the supply of corn silage or replacing it in diets are as follows:

1) Reduce the amount of corn silage in the diet to stretch the supply by increasing the inclusion level of high-quality legume or grass hay or silage.
2) You can stretch the supply of corn silage by removing it from rations for the growing heifers and dry cows and feeding them all hay or haycrop forages.
3) All of the corn silage in the diet of the lactating cows can be removed and effective fiber and nutrients balanced using other high-quality forages and concentrates. Some University of Georgia researchers several years ago advocated the feeding of up to 10 to 15 lb/day of an artificial corn silage consisting of 40% soybean hulls, 30% cottonseed hulls, 25% ground corn, and 5% cottonseed meal. This results in a mixture with the composition of 11.9% CP, 53.5% NDF, 19% starch, and about 0.63 NE_L/lb. Given that soybean hulls have been overpriced for quite some time (see latest issue of BDN mentioned above), wheat middlings was used to formulate a different mixture consisting of 40% wheat middlings, 34% cottonseed hulls, and 26% ground corn (11.9% CP, 45.9% NDF, 19.7% starch, and 0.64 NE_L/lb). Caution is expressed in using cottonseed hulls in OH due to their cost; presently, they are only valued at $23/ton using the nutrient values published in the July BDN. However, the bottom line on this approach is to work with your dairy nutritionist so a diet can be formulated without corn silage that can provide the nutrient supply needed, keep the rumen healthy, and not limit intake of the animal. Then you will want to monitor animal performance with the new feeding strategy so adjustments can be made if necessary.

With variable weather conditions throughout the State, composition of corn silage will likely be quite variable in Ohio this year. Thus, as usual, multiple samples will need to be analyzed so diets can be adequately formulated. Hopefully, yield of corn and soybeans will be good which will help to keep feed prices moderated. At the moment, milk prices are low and on the bubble, hopefully tipping upward. So carefully monitoring income over feed costs will be pivotal in the upcoming months. You and the nutritionist will need to be on each other's speed dial.

Table 1. Typical composition of corn silage based on samples submitted from May 1, 2000 to April 30, 2016 to the Dairy One Forage Lab in Ithaca, NY (http://dairyone.com).[1]

Item	Average	SD	CV (%)	Typical Range
DM, %	33.7	9.3	27.6	24.4 – 43.0
CP, % of DM	8.27	1.06	12.8	7.21 - 9.32
Starch, % of DM	31.8	7.5	23.6	24.3 – 39.3
ADF, % of DM	25.8	4.1	15.9	21.7 – 29.9
NDF, % of DM	43.6	5.9	13.5	37.7 – 49.6
NDFD 30 hr, % of NDF	52.5	6.1	11.6	46.4 - 58.6

[1]DM = dry matter, CP = crude protein, ADF = acid detergent fiber, NDF = neutral detergent fiber, NDFD = NDF digestibility, SD = standard deviation, and CV = coefficient of variation ((SD/average) * 100).