

Keys to Producing High Quality Corn Silage in Western Canada

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Why is this important?

Corn silage can be a good alternative to small grain silage for dairy cows because of its high dry matter (DM) yield and high digestible energy content. We estimate that about 50% of dairy producers in Alberta are currently growing or have tried to grow corn for silage. However, corn grown in western Canada does not always achieve its potential due to the limited growing season. Many recommendations for producing high quality corn silage originate from studies conducted in the USA, with limited applicability in areas with a shorter growing season. So, we conducted research in western Canada to understand the important factors to consider when producing high quality corn silage for dairy cows in short season areas.

Table 1. Nutrient content of corn in our study compared to the rest of Canada

Source	DM ¹ (%)	TDN ¹ (% DM)	CP ¹ (% DM)	Starch (% DM)	NDF ¹ (% DM)
Rest of Canada ² (n = 700)	34 ± 13	72 ± 2	9 ± 1	30 ± 6	43 ± 5
Our Study (n = 255)	34 ± 6	65 ± 8	8 ± 2	24 ± 18	54 ± 11

¹DM = dry matter, TDN = total digestible nutrient content, CP = crude protein, NDF = neutral detergent fibre

²From Cumberland Valley Analytical Service

What did we do?

Corn hybrids were grown for silage in 3 years (2013, 2014 and 2015) in 4 different locations (Lacombe, AB; Lethbridge, AB; Vauxhall, AB; Elm Creek, MB) representing various environmental conditions in western Canada. At each location, 6 hybrids were planted in replicated plots. Corn hybrids marketed in Canada are rated for maturity using the corn heat unit (CHU) system, which indicate the number of accumulated thermal units needed from planting to grain maturity. Hybrids used for silage can have grain maturity ratings 100 to 200 CHU less than those used for grain because they are harvested at a lower DM content before the grain is fully mature. CHU zones in Canada are mapped according to the growing season and long-term weather data. Hybrids are then selected such that their CHU rating fits within the CHU rating of the location in which they are grown.

Given that each location in our study has a different CHU rating, hybrids grown in each location differed and were selected such that the CHU rating of the hybrids overlapped with the rating of the zone. The CHU ratings of the hybrids used in the study were: Lacombe, 2000 to 2200; Lethbridge, 2000 to 2600; Vauxhall, 2175 to 2650; and Elm Creek, 2175 to 2650. The plants were harvested before and after frost.

What did we find?

Hybrid Selection

Yield and nutritional value of corn silage is mainly determined by CHUs received from planting to harvest. Hybrids with CHU rating > than the CHU zone may yield more DM, but kernel development, and thus starch content, can be limited by the short growing season and the onset of frost prior to harvest. In all four locations, later maturing corn hybrids had greater yields than earlier maturing hybrids; however, these hybrids may not reach the desired DM content and kernel maturity (and starch content) before frost occurs.

Maximizing Digestibility and Energy Content

Average total digestible nutrient content (TDN, a measure of energy content) of hybrids in our study was 65% DM, ranging from 54% to 73%. The low TDN forages were those with low starch content, which negatively affects milk yield. As the corn plant matures, its TDN content increases due to the increase in starch content in the grain, despite increased maturity of the fiber in the forage. Starch content is optimized by growing a hybrid that will achieve the desired DM content at harvest (before frost). Choosing an early corn hybrid for a lower CHU zone may sacrifice yield for kernel maturity, but results in more milk per tonne of silage produced.

Summary Points

- Despite a limited growing season, corn grown in Western Canada has the potential for high silage yield
- Select a corn hybrid with a CHU rating that matches the long term rating of the growing location
- Harvest corn when the whole plant contains 32 to 38 % dry matter content
- Process kernels at the time of harvest to maximize starch availability in the rumen

When to harvest

Corn should be harvested for silage when the whole plant is 32 to 38% DM. It is important to select a hybrid that will reach the ideal DM content before frost and to monitor whole plant DM content near the end of the growing season to know when to harvest. Standing corn plants dry down at a rate of about 0.5 percentage units per day (faster in dry and hot weather and after frost), so it may be necessary to start the harvest at a lower DM and end at a higher DM. Silages that are too dry (>40% DM) are difficult to pack and are poorly fermented, while silages that are too wet (<28% DM) will cause seepage and excessive fermentation acids.

What does this mean?

Chemical composition and energy content of corn silage grown in western Canada are highly variable, which will affect intake and milk production of cows. At the very minimum, it is important to analyze corn silage for starch, neutral detergent fiber (NDF), and digestible NDF content, as these components will determine intake potential and energy content. It is important to harvest silage at the optimum DM content to promote fermentation in the silo and optimize DM intake potential. Because later maturing hybrids may not reach the desired DM content before the first frost occurs, it may be necessary to sacrifice yield to ensure quality by selecting a hybrid that is adapted to the local growing environment. This can be done by selecting a hybrid close to or within the maturity rating of the local CHU zone. In the coolest parts of the province even the earliest maturing corn hybrids may not reach 32% DM before frost and they will have relatively low starch contents. The quality of silage from these short-season areas may be similar to that of barley silage, but yields may be too low to make corn silage an economic option. To maximize the energy content of the silage, the starch in the silage needs to be available, and thus kernel processing is required.

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