

Best Practices for Silage Production:

How to Maximize Quality and Minimize Cost

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Silage production is an important part of dairy farming in Canada and there are a number of factors to consider when making decisions about silage production, management, and storage. Researchers at Dalhousie University, University of Manitoba, Université du Québec en Abitibi-Témiscamingue, and Agriculture and Agri-Food Canada investigated the impact of various management practices on silage quality in this research.

Successful milk production relies heavily on good forage crop management and the production of high-quality silage.

In Canada, many dairy farmers make and store their own silage that they use to feed their cows all year round. Silage quality impacts animal health, production, and longevity, so it is a critically important piece of dairy farming.

Dairy cows require good quality silage to provide them with sufficient energy, protein, and fiber to maintain body condition, aid in rumen health, and optimize milk yields.

When producing silage, farmers are faced with a number of different factors that will impact their silage quality, including type of storage system and different forage management practices. So, how do you know what's right for your farm? This is what researchers worked to find out!

Key Points

Good quality silage can be made in a variety of ways. High quality silage was found across Canada in wrapped round bale, tower silo, and bunker silo systems.

Certain practices can help increase silage quality. Earlier harvest, increased legume content, addition of bacterial inoculant, and avoiding use of mower conditioners resulted in higher silage quality parameters.

Wrapped round bale silage had slightly higher quality parameters and the highest gross margins when compared to other systems.

Presence of fungal mycotoxins in all types of silage samples was low, meaning there is minimal risk to cattle health.

What Management Practices Impacted Silage Quality?



Harvest date matters!

Cutting earlier produced silage that was higher in quality and digestibility. Results showed that first cut silage samples that were harvested earlier had higher crude protein, and digestibility, as well as lower lignin, pH, oxalic and butyric acid content.



Legume is beneficial

Increased legume content showed beneficial effects on silage quality, such as decreased butyric acid, reduced acid detergent fibre (ADF), increased digestibility, increased digestible nutrients, and increased crude protein.



Not using mower conditioners increased quality

When *not* using a mower conditioner, dry matter digestibility of silage increased, ADF decreased, total digestible nutrients (TDN) increased, and lignin content decreased.



Bacterial inoculants have a positive impact!

Using a bacterial inoculant increased silage digestibility, reduced pH, reduced butyric acid content, and increased lactic acid content.

What About the Type of Silage Storage Used?

In Canada, silage is commonly stored in **bunker silos, tower silos, or as wrapped round bales**. The decision for how best to store silage is based on many factors, such as farm type, size, layout, and resources. Ultimately, different silage storage systems will work for different farms, and this research provides some insight into how various systems compare to each other.

- ⊕ **In vitro dry matter digestibility at 48 hours.** The proportion of dry matter in feed that can be digested by animals) was similar across all 3 silage systems
- ⊕ **Wrapped bales had the highest quality parameters when compared to tower and bunker silos.** Analysis showed wrapped bales had lower ADF, lower ash, higher crude protein, higher TDN, lower ammonia, and higher dry matter digestibility.

How Does Return on Investment Compare Across Silo Types?

Economic viability is a key factor to consider when deciding on which silo type is best for your farm. Budgeting analysis was done to create models for estimating annual costs and gross margins for each of the 3 silo types. Using a 150 kg butterfat daily quota estimate, estimates of silage costs for production and processing, as well as gross margins, were calculated on a per-year basis.

Analysis showed that wrapped round bales had the lowest annual cost, with the highest gross margin of the 3 common silo systems.

Silage production and processing costs per year, as well as gross margins, from 150 kg butterfat daily quota.

		
Bunker	Tower	Wrapped bales
Annual Cost \$120,600	Annual Cost \$130,400	Annual Cost \$72,700
Gross Margin \$944,200	Gross Margin \$934,500	Gross Margin \$992,200

While these results are important for farmers who are considering switching silo types, building a new facility, or looking for additional silage storage capacity, **it is important to note that the best silage storage system for your farm is the one that works best for you!**

How Does Spoilage Affect your Silage?

A key component of silage production involves grasses and legumes undergoing fermentation in an air-free environment. When fermentation is successful, the feed that is produced is high in quality and nutrition, and can be safely stored for many months. Fermentation helps to preserve nutrients in silage, which is why this step is so critical in the feed-production process.

If silage is exposed to air during or after fermentation, the silage can spoil due to fungal contamination. When fungi spoil silage it is not only less palatable and nutritious, but if mycotoxins are produced it can also be dangerous for cows to eat. Mycotoxins are chemical compounds produced by some species of fungi and can cause gastrointestinal issues, decreased appetite, reduced weight gain, and even organ damage in cattle. So, what types of fungi and mycotoxins did the researchers find?

- ⊕ While 94% of samples contained fungi species that had the potential to produce mycotoxins, **fewer than 10% of samples actually contained detectable quantities of mycotoxins.**
- ⊕ The most common fungal strain found in Canadian silage samples was from the *Monascus* genus. Other types of fungi and yeasts, such as *Penicillium* and *Pichia*, were also identified in the samples.
- ⊕ Generally, type and abundance of fungi didn't differ between geographic location or type of silage storage. However, in Atlantic Canada, a small number of fungi were more commonly found in tower silos when compared to bunkers or wrapped bales.

Mycotoxins are chemical compounds produced by some species of fungi and can cause:

- ⊕ Gastrointestinal issues
- ⊕ Decreased appetite
- ⊕ Reduced weight gain
- ⊕ Organ damage in cattle



So, what does this all mean? The results show that while there was fungi present in many of the feed samples collected, most were not actively producing mycotoxins and the risk to cattle is therefore low.

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