

Valacta
Dairy Production Centre of Expertise
Quebec-Atlantic

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The secret of good quality silage

Making the most of nature

Grass is ready to be ensiled when it contains between 35 and 45 per cent dry matter. Just a few hours of drying time may be sufficient: all you have to do is make the most of what nature has to offer.

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The weather in the summer of 2008 was awful, and 2009 was even worse. When it rains one day out of three, sometimes without warning, a technique like silage-in-a-day is an obvious asset when you're trying to get the most out of every harvest day.

Mowing and ensiling the same day—it can be done

Many people still believe it's impossible to mow in the morning and ensile in the afternoon at proper moisture content. Yet, more and more producers have been trying the technique and making a success of it, particularly since the summer of 2008, after taking part in Valacta's "Haycrop silage: Aiming for quality" workshop. And not only is it possible to ensile a few hours after mowing, but on top of that, there's a huge improvement in forage quality!

When it comes to convincing sceptics, however, there's nothing like concrete evidence. Here then, in a few words, are the ABCs of silage-in-a-day, with results that speak for themselves.

The ABCs of same day silage

At dawn, under normal moisture conditions, forage plants contain 80 per cent moisture. In order to ensile the forage the

same day you cut it, the moisture content will have to drop to around 60 per cent (35 to 45 per cent dry matter, depending on the storage method). There are two tricks to managing that: wide-swath mowing and unconditioned plants.

1. Wide swaths

A narrow swath covers only 35 to 40 per cent of the mowed area, and a large part of the cut material remains shaded, without air circulation. A wide swath, on the other hand, covers at least 70 per cent of the mowed area, and almost all of the grass is exposed to sunlight, *which means the stomata stay open*. The stomata are the plant's pores, and it is through them that the plant releases 80 to 90 per cent of its moisture (see box). If a plant is to lose 20 per cent of its moisture in only a few hours, the stomata need to be kept open, which means keeping the cut grass exposed to sunlight. So the first key to success is a wide swath.

2. Avoid conditioning

Drying (especially the first phase; see box) goes faster if the plants are left intact, *i.e.* unconditioned, which ties in with the previous practice. Conditioning breaks the plant stems and so impedes the natural movement of water from the roots to the leaves. The moisture in the stem is thus deprived of its main outlet – the stomata – and the drying phase slows down. The second key to rapid drying is to avoid conditioning.

Does it actually work?

So, wide swaths and unconditioned plants. It really works? The answer is YES.

Researcher Tom Kilcer and

his team at Cornell University demonstrated the technique under various conditions. The figure below illustrates the results of an experiment carried out under poor and good drying conditions. The swaths were not moved. The points on the graph represent the moisture content of the forage: green triangle for wide swaths, red diamonds for narrow swaths.

Left, first-cut alfalfa, under poor drying conditions: less than eight hours after mowing, the moisture content of the forage left in wide swaths had dropped to 62-65 per cent, low enough for ensiling. In contrast, the moisture content of the forage in narrow swaths was still over 70 per cent more than 24 hours after cutting.

Right, second-cut alfalfa, this time under good drying conditions: a mere three hours after cutting, the moisture level of the forage left in wide swaths

was down to 60-65 per cent, whereas, in the narrow swaths, the moisture content was still over 60 per cent 24 hours after mowing.

And don't go thinking you have the whole day in front of you. Take a close look at the graph to the right: when conditions are good, three hours is all it takes for the moisture content to reach the optimum range. After four hours, the grass may already be too dry to be stored as silage..

In Quebec, too!

In 2008, more than 200 dairy producers in Quebec took part in Valacta's workshop on same day silage. In 2009, more than 650 did the same. Many of them have since used the technique successfully. To validate their experience—and convince sceptics—Valacta employees in the Eastern Townships and the Beauce closely monitored harvest operations on a number of

farms trying the technique for the first time. Table 1 presents the data for two farms in the Eastern Townships that managed to harvest their silage at the targeted moisture content within ten hours of mowing, *i.e.* in the same day. Would they be willing to do it again? They certainly would—and did, as of the second cut!

Obviously, drying conditions can vary greatly from one season to the next, from one day to the next. For successful same day silage, a number of factors must be taken into consideration, such as cutting height, mower width, and swath width depending on the mower model, to name but a few. But one thing is clear: same day silage has proven its worth. The response is unanimous: "We sleep well at night because everything's done."

Have a good summer!

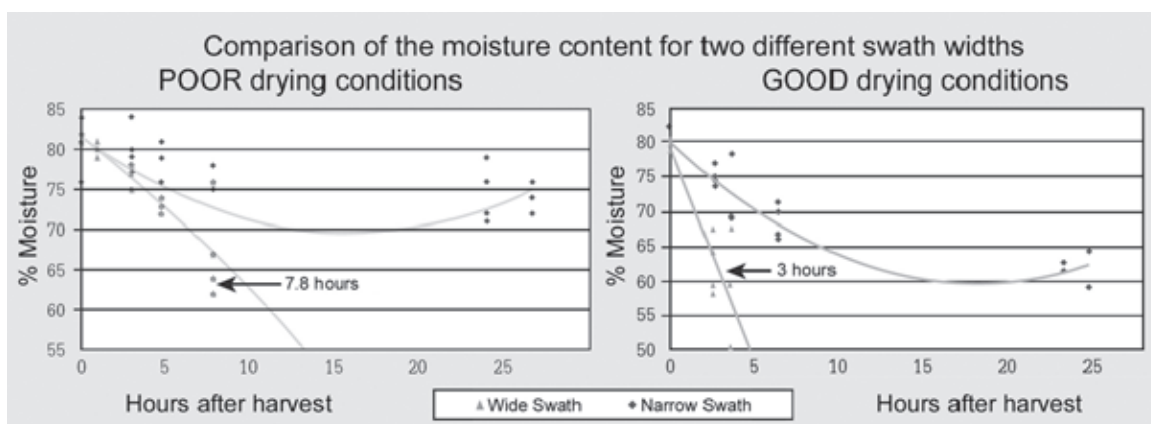


Table 1. Results from two farms in the Eastern Townships— Same-day silage, June 2009.

Farm	Nbr. of samples analyzed	Cutting dates	Time of mowing	Area (acres-per-day)	Swath width	Start of raking	Start of harvest	Dry-matter		
								Min.	Average	Max.
A	4	4-5 June	6 am to 10 am	55	61% & 68%	1 pm	3:15 pm	39.8	42.4	46.9
B	3	5-6 June	From 5:30 am	30-40	70%	12 noon	2 pm	35.2	41.4	45.1

(*Journée laitière de l'Estrie*, November 2009)

The ABCs of drying

Understanding the drying process makes for a more efficient harvest. Although plants are complex organisms, the following principles are fairly simple:

Stomata

Stomata are pores in the plant's leaves that allow the passage of carbon dioxide, oxygen and moisture. A growing plant loses 80 to 90 per cent of its moisture through its stomata. In forage

plants, stomata generally open during the day and close at night (or in darkness) to reduce moisture loss.

Drying

Drying occurs in 3 phases¹. During the first phase, the moisture level drops rapidly to 60-65 per cent. The second, slower phase ends when the forage reaches 40 per cent moisture. The third, and longest, phase ends when the moisture content is

acceptable for storage as hay (20 per cent).

Phase 1

When drying begins, moisture moves in two directions: along the stem toward the extremities (axial movement) and from the centre of the stem toward the surface (radial movement). The natural passage of moisture toward the leaves and through the stomata (called evapotranspiration) is

the dominant pathway. Hence, moisture loss is more rapid in intact plants than in an equivalent quantity of separate stems and leaves. In good drying conditions, plant moisture reaches 57-65 per cent before the stomata close, well within the acceptable range for good silage. Evapotranspiration is therefore the most efficient drying mechanism. Exposure to sunlight and wind is comparatively ineffective.

Once the stomata close, axial movement slows, and radial migration takes over. Because stem walls are more resistant than open stomata, however, the speed of moisture loss is reduced by a factor of 10. That's why phases 2 and 3 of the drying process play virtually no part in same-day silage.

¹Forage conditioning, from harvest time to the cow, conference by Jean Brisson, Dairy Cattle Symposium, Drummondville, QC, October 30, 2008.