

FOUR STEPS TO MAKING HIGH-VALUE HAY

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There is nothing quite like opening a bale of high-quality alfalfa hay – the smell of the alfalfa, the multitude of green leaves enclosed within – the experience is like no other. If only every bale we made turned out like this!

The steps to making high-value hay are straightforward:

- 1) Start with a good, full stand of healthy plants;
- 2) Cut it at the proper maturity under ideal drying conditions;
- 3) Bale the alfalfa quickly at optimum moisture levels;
- 4) And store the bales undercover.

We can control most of these steps with the exception of the weather. Long periods of warm, rainy weather in spring can be problematic, causing alfalfa to mature beyond the ideal bud stage. It's also a challenge in the Midwestern and Northeastern regions to bring in the first cutting without early season-rain damaging hay lying in the field. However, the other factors are under human control, and if we do the best we can at each phase, we are well on the way to making high-value hay.

Start with a good, full stand of healthy plants

Each region of the country has its own recommendations for stand rotation. In the Midwest, the producers who typically get the best yields year after year are rotating an alternate crop in after two to three years. Of course, severe winters inflict winterkill on stands and play a role in this cycle. In years when you desire the stand to overwinter, you should ensure the last cutting is taken before Sept. 1 or after first frost. This will minimize new growth in the fall that pulls nutrient reserves out of the roots.

Cut at the proper maturity under ideal drying conditions

Weather permitting, the ideal maturity to cut alfalfa is in the bud to one-tenth bloom stage. This maturity is the perfect blend of yield and high nutrient value. Alfalfa should be cut in the morning – leaving only 1- 2" of stubble, and it should be conditioned when cut to disrupt the waxy cuticle on the stem. The exception to the recommendation of leaving 1-2" stubble would be to leave more stubble (4") during the last cutting of the season in order to catch snow and help the plants overwinter more successfully.

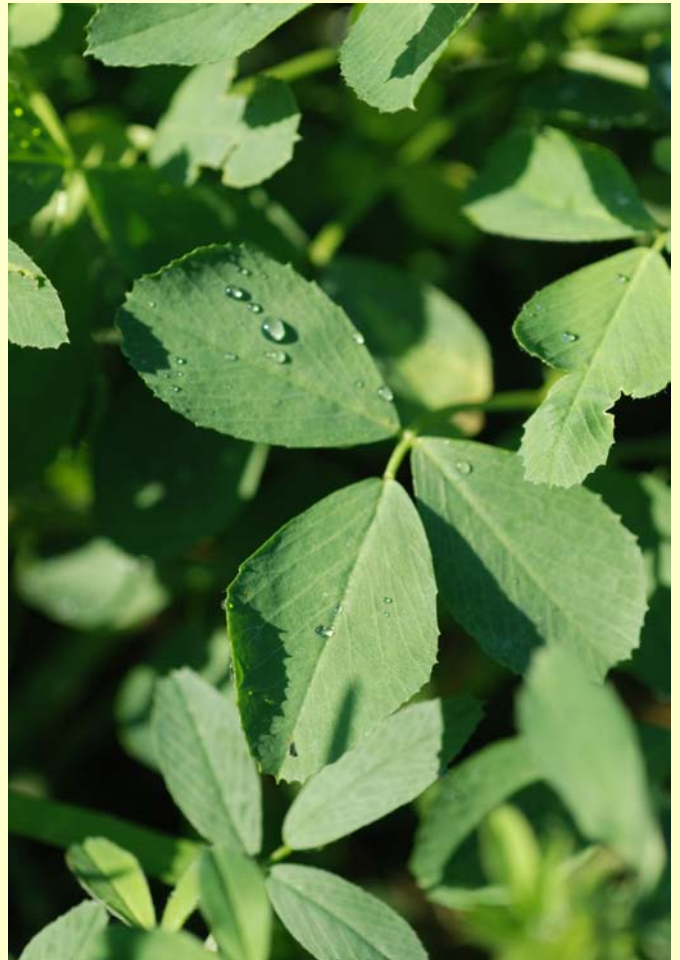
With the introduction of low-lignin alfalfa varieties, hay growers may have a wider harvest window without losing digestibility. This gives growers the flexibility to delay harvest to a later stage of maturity.

For example, harvesting three times at first flower has the potential to provide the same quality as four cuttings at bud stage while providing greater yields. In university trials in Minnesota and Wisconsin, yields from an early flower harvest regime were from 15% to as high as 40% greater for delayed harvests after bud stage.¹

To promote rapid drying, alfalfa should be laid out in wide swaths that are at least 70% or greater the width of the cut row. Wide swaths increase overall hay quality due to two main factors – the hay dries faster, and hay cured in wide swaths has a lower ash content.

The mechanics of drying

The first phase of drying is moisture loss from the leaves through the stomata or pores in the leaf surface. These stomata allow moisture evaporation from the plant to cool it and carbon dioxide uptake from the air as the plant is growing. Stomata open in daylight and close when in dark and when moisture stress is severe. Cut forage laid in a wide swath maximizes the amount of forage exposed to sunlight, thereby keeping more stomata open. This



encourages rapid drying, which is key at this stage because plant respiration or metabolism continues after the plant is cut. Respiration rate is highest at cutting and gradually declines until plant moisture content has fallen below 60%. Therefore, rapid initial drying to lose the initial 15% of water from forage will reduce loss of starches and sugars and preserve more total digestible nutrients in harvested forage. Conditioning doesn't affect this initial moisture loss.

The second phase of drying is moisture loss from the leaf surface (stomata have closed) and the stem. At this stage, conditioning can help increase the drying rate, especially as the forage becomes drier.

The final phase of drying is the loss of tightly held water, particularly from stems. Conditioning is critical to enhance drying at this phase. Conditioning to break stems every 2" or scrape the waxy cuticle off will increase water loss through the waxy cuticle of the stem.²

Bale alfalfa quickly at optimum moisture levels

Alfalfa destined for hay should be raked or merged at 40-60% moisture to minimize leaf loss. On average, 78% of alfalfa cut reaches livestock in the U.S. The remaining 22% is lost during mowing, raking, baling, and storage. These hay volume and quality losses are costly.³

Commonly recommended moisture levels for baling and storing hay are 18-20% moisture for small square bales and 14-16% moisture for larger bales. Baling much drier than these recommendations will lead to excessive leaf loss and consequent loss of protein. If hay is baled wetter than these levels, an organic acid preservative should be used to minimize heating, molding, losses of dry matter, and nutritive value. Propionic acid and other organic acids have been used as preservatives for hay baled at moisture levels above 18-20% for four decades. Organic acids (especially propionates) act by disrupting the enzymatic processes associated with plant and microbial respiration; thereby, reducing overall respiration and accumulation of heat as well as limiting loss of dry matter and reductions in nutritive value.

Buffered organic acid preservative as insurance

In recent years, the industry has come to recognize there is an advantage to using organic acids not only so hay may be baled sooner, but also because organic acids suppress the growth of molds that are naturally present on forages in fields when cut. Buffered blends of various organic acids are a cost-effective way to control bale heating. Use of these products allows producers to safely bale and store hay at up to 25% moisture.

After all the hard work of harvesting a great stand of alfalfa at the proper maturity level and drying it rapidly, doesn't it make sense to take the last step to ensure your hay remains top-quality alfalfa hay? For university recommendations and research on the value of proper hay-bale storage, visit:

[Hay Storage Options: How Do They Stack Up?](#)

[Big Bale Storage Losses; how different options stack up](#)

[Dry Round Hay Bale Storage Costs](#)

[Preserving the value of dry stored hay](#)

[Tips to Consider when Stacking and Storing Hay This Season](#)



References

¹ A. M. Grev, M. S. Wells, K. L. Martinson, D. A. Samac, C. C. Sheaffer, and D. Undersander. 2018. Advantages of reduced-lignin varieties. University of Minnesota Extension <https://extension.umn.edu/forage-harvest-and-storage/reduced-lignin-alfalfa-varieties#widened-harvest-window-1049911> – accessed on May 1, 2019.

² D. Undersander and C. Saxe. 2013. Field Drying Forage for Hay and Haylage. Focus on Forage; vol. 12, no. 5 <https://fyi.extension.wisc.edu/forage/files/2014/01/SwathDrying-FOF.pdf> – accessed on April 18, 2019.

³ University of Arkansas. 2005. Harvesting Alfalfa Hay. Publication number FSA2005 -PD-3-06RV.