



## What is lignin and how does it impact alfalfa quality and yield?

*By Mark McCaslin*

Alfalfa is an excellent source of fiber and an energy-rich, high-quality protein source, making it a staple ingredient in most dairy cow diets. When it comes to harvesting this versatile crop, the dilemma often faced is whether to harvest early to maximize forage quality, but sacrifice yield OR harvest later for higher forage yield, but lower forage quality. However, new options may alleviate the need to choose between tonnage and quality.

The answer points to a small, but significantly important component of alfalfa, known as lignin.

Similar to the human skeleton, lignin provides structure – making it possible for the alfalfa plant to stand upright. Lignin is part of the plant cell wall and although it is critical for maintaining plant standability, it is also indigestible.

Although lignin makes up a small portion of the plant – just 7 to 8 percent – its impact on digestibility is big. As lignin levels increase with plant maturity, digestibility drops, causing a decline in forage quality.<sup>1</sup>

Dairy cows are unable to digest lignin, and lignin binds with other fiber components further decreasing fiber digestibility. Therefore, lignin content is an important limiting factor for fiber digestibility in alfalfa.<sup>1</sup>

### **Lignin reduction increases fiber digestibility**

Genetically enhanced HarvXtra™ alfalfa, uses gene suppression to “rewire” the process that alfalfa plants use to make lignin, changing both lignin content and composition. This genetic reduction in lignin content in alfalfa increases fiber digestibility, relative to conventional alfalfa, at all stages of maturity. With the commercial introduction of HarvXtra™ alfalfa this spring, alfalfa producers can enjoy greater flexibility and a wider cutting window to maximize forage quality and yield potential.

HarvXtra™ alfalfa has shown a consistent 15+ percent decrease in lignin content combined with a 12 to 15 percent increase in neutral detergent fiber digestibility (NDFd) and relative forage quality (RFQ) when compared to conventional alfalfa harvested at the same growth stage. Even though lignin levels have been reduced, there's no danger of the plant tipping over – its structure is still intact.

HarvXtra™ alfalfa plants look and feel like conventional alfalfa, delivering competitive levels of forage yield, persistence and pest resistance while showing no increase in lodging risk. And whether ensiled or fed as dry hay, its quality remains the same.

### **Achieve higher quality *and* higher yield**

By transforming the relationship between forage quality and stage of maturity, genetically enhanced HarvXtra™ alfalfa provides benefits beyond what is possible with conventional breeding techniques. You no longer have to choose between high-quality forage and more yield – both goals are now attainable.

Designed to help you better manage the yield versus quality trade-off, HarvXtra™ alfalfa helps growers maintain high-quality alfalfa for a longer period of time. It gives you more options. For example, you may choose to follow your current harvest schedule to obtain higher-quality forage, or delay harvest for 7 to 10 days to extract higher yield without sacrificing quality. This delayed harvest option has the potential to eliminate one extra cutting during the season.

Previously, alfalfa harvested in the Midwest on a three-cut system contained much lower quality, but now it's possible to achieve higher yield of the same quality as standard varieties cut earlier. In various trials, HarvXtra™ alfalfa had nearly the same NDFd as conventional alfalfa harvested one week sooner.<sup>1</sup> Field trials

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<sup>1</sup> D. Undersander, M. McCaslin, C. Sheaffer, D. Whalen, D. Miller, D. Putnam, S. Orloff, Low lignin alfalfa: Redefining the yield/quality tradeoff, 2009 Western Alfalfa & Forage Conference

conducted in 2015 showed the lignin content in HarvXtra™ alfalfa to be up to 20 percent lower than conventional varieties harvested at the same time.<sup>1</sup>

HarvXtra™ alfalfa will yield as well as, if not better, in a three-cut system versus four. And in three-cut scenarios, you'll also gain more yield per cut. Multiple trials conducted at the University of Wisconsin revealed a 15 to 20 percent yield advantage for a three-cut versus four-cut management system over a four-year rotation.<sup>2</sup> In contrast, when harvesting a conventional variety earlier in order to match the quality of a reduced-lignin (HarvXtra) variety, you're likely to give up tonnage.

Harvesting on a less aggressive schedule is beneficial for many reasons, enabling you to:

- Extend the life of the alfalfa stand due to less traffic and less compaction over the soil.
- Utilize the full growing season.
- Produce healthier alfalfa by reducing stress on the stand, which has been shown to improve persistence and lifetime yield.
- Save money on fuel, labor and equipment wear and tear.

### **Increased milk production potential**

The higher volume of digestible fiber found in high quality alfalfa may optimize your rations in four different ways – by driving up dry matter intake (DMI), increasing feed efficiency, lowering feed costs and improving animal performance.

Making fiber more available to the cow's rumen can stimulate DMI, thereby boosting milk production. For every 1 pound increase in DMI, you can expect a 2.4 pound increase in fat corrected milk (FCM) when rumen fill is high and the cow is in early lactation and good body condition.<sup>3</sup> A 3 pound increase in intake would then translate to 7 to 8 pounds of additional milk per cow.

Genetically enhanced HarvXtra™ alfalfa is a breakthrough technology for improving alfalfa quality and yield potential, while providing a broader harvest window with the option to reduce the number of seasonal cuttings. Talk with your agronomist and nutritionist to determine how best to incorporate this specialized alfalfa into your dairy operation.

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<sup>2</sup> [http://www.harvextra.com/downloads/The\\_Development\\_of\\_HarvXtra\\_Alfalfa\\_White\\_Paper.pdf](http://www.harvextra.com/downloads/The_Development_of_HarvXtra_Alfalfa_White_Paper.pdf)

<sup>3</sup> M. Oba, M.S. Allen, Michigan State University, Journal of Dairy Science, 1999, Evaluation of the importance of digestibility of neutral detergent fiber from forage: effects on dry matter intake and milk yield of dairy cows