



Reduced-lignin trait could revolutionize alfalfa

MOST forage growers associate biotechnology traits with the corn plant. However, for nearly a decade, a consortium of companies have been developing a transgenic trait that could represent the “holy grail” for alfalfa growers. The consortium consists of Forage Genetics International, Samuel Roberts Noble Foundation, Monsanto, U.S. Dairy Forage Research Center and DuPont Pioneer. The trait is reduced-lignin (R-L) alfalfa.

While R-L alfalfa will likely not be cleared for commercial sale until 2016 at the earliest, it is already starting to gain visibility in popular press and in company and university restricted-planting research plots. What R-L offers is a solution to the tension that always existed between alfalfa yield and quality.

Harvest paradigm shift

It wasn't that long ago that the following statement appeared in this column: “It's possible that we

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would never see alfalfa blossoms from seeding through plow down.” This is because current harvest recommendations for dairy-quality alfalfa typically sacrifice yield by cutting alfalfa in the late-bud stage. This translates to at least three and often four or more harvests per season.

In geographies that typically take four harvests, there is opportunity to improve yields upwards of 15 to 20 percent by harvesting only three times, and obtaining the same or better quality than late-bud harvests. R-L alfalfa can totally change the impression of second-cut alfalfa, which is grown under excessive heat and often results in poor herd performance when cows are switched onto this cutting.

While the technology fee for R-L seed has yet to be determined, R-L alfalfa should result in a significant reduction in cost of production due to improved yields from fewer trips across every alfalfa acre. It is also believed that stand life will be extended due to reduced wheel traffic damage and much improved root carbohydrate storage in plants that are allowed to mature beyond late-bud

stage. We have probably underestimated the stress put on aggressively-harvested alfalfa stands considering that initial regrowth following harvest is dependent on carbohydrates stored in the tap root.

Nutritional considerations

Lignin in alfalfa cell walls (primarily the stem) acts similar to rebar in concrete to enhance plant structural integrity. A query of the Dairyland Laboratories, Inc., database shows that from 2010 to 2012, alfalfa hay averaged 7.6 percent lignin (range of 5.3 to 9.8) with alfalfa silage averaging 8.4 percent (range of 6.3 to 10.6). It is interesting that silage would have higher lignin than hay, but this could be a result of uncontrolled fermentation which would reduce sugars and thus elevate the lignin. Early indications are that R-L alfalfa, even with upwards of 20 percent less lignin in the plant, does not lodge with any greater frequency than conventional alfalfa varieties.

The downside of lignin is that it interferes with the rate at which rumen bacteria can access and ferment cell wall cellulose and

hemicellulose. The improved fiber digestibility of R-L alfalfa will likely provide the most benefits in transition and early-lactation diets where dry matter intake is of most concern.

Research will be needed to determine desirable physically-effective fiber levels in rations containing R-L alfalfa, especially if it is coupled with BMR corn silage. Research published in 2010 by Utah State University details this possible associative effect of feeding multiple highly digestible forages. They found that despite a substantial improvement in NDF digestibility of BMR corn silage, feeding a BMR-based TMR had limited effects on intake, digestibility and milk production when fed in high-forage diets containing high-quality alfalfa hay.

As the alfalfa and corn seed industries provide forage products with much needed improvements in yield and fiber digestibility, the dairy industry will need to be sure that laboratories are capable of correctly profiling rates of fiber digestion and that these “high-octane” forages are combined in the proper way when formulating diets. 🐄