IS THERE A YIELD PENALTY TO LOW LIGNIN ALFALFA?

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The GM reduced lignin trait has been released commercially in conjunction with Monsanto Company under the brand name of HarvXtra alfalfa.

One study in Wisconsin and Pennsylvania evaluated the trait with and without grass. HarvXtra was seen to have higher fiber digestibility than a conventional line in both the seeding year and the first production year. There was no yield drag due to the reduced lignin trait. Further, if the HarvXtra trait harvest was delayed 10 days to have similar quality to conventional varieties, the HarvXtra trait was always significantly higher in yield.

One six-state study evaluated change in nutritive value over time of HarvXtra alfalfa compared with conventional varieties in six states (KS, MI, OH, PA, CA, WI) in 2015. HarvXtra-008 was consistently lowest in lignin (ADL) on all dates at all sites, higher in neutral detergent fiber digestibility (NDFD, +49.6 g/kg) and lower in neutral detergent fiber (NDF, -29.6 g/kg) and ADL (- 9.0 g/kg) than the other two cultivars across locations and dates. This represents a 10% increase in NDFD, 10% decrease in NDF, and 18% decrease in ADL across locations and sampling dates. Although HarvXtra-008 did not appear to have a slower rate of decline in nutritive value over time than the other two cultivars, it was consistently superior in nutritive value on all dates sampled in the seeding year. Yield of the reduced lignin trait was similar to conventional lines if harvested at 28 days. While the yield was about 4% less than conventional lines for harvests at 33 and 38 days, when compared to conventional lines harvested at earlier dates (to have similar forage quality) yield of HarXtra was higher. The lower yield than conventional varieties at later harvest could also be a function of the specific varieties chosen for comparison.

The reduced lignin alfalfa provided farmers with the following choices:

(1) Higher quality forage (if harvested at same time as in the past).
(2) Greater yield (if delay harvest for same quality as in the past), yield increases about 160lb DM/day.
(3) Greater flexibility (to choose either #1 or #2, but not both) depending on the weather.

For farmers at very high levels of milk production the choice will be higher forage quality. Farmers will benefit from the improved energy content but mainly from increased dry matter intake where a 10% increase in NDFD would be expected to equal 4*.55/milk/day = 2.2 lb of milk/day. However, this milk increase would only be expected if alfalfa is cut on

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normal schedule, cow dry matter intake increases, body condition score is good, and cows are in early lactation.

Note that manure will also be reduced if forage quality increases.

We believe that the greatest benefit to many dairymen will be the increase in yield resulting from a 5- to 7-day harvest delay to get the same forage quality as in the past. Our data show that alfalfa increases an average of 160 lb DM/acre/day around harvest. Thus, delaying harvest will result in 800 to 1100 lb more yield per cutting. This can particularly benefit farmers who are cutting on a 28-day schedule and have unused growing season left at the end of the summer (e.g., if fourth cutting is taken 20 August but could wait to early September to take the last cutting).

The delayed harvest should also increase plant health resulting in improved persistence and earlier spring greenup.

Reduced lignin varieties will also benefit farmers who plant grass with the alfalfa. First cutting is of greatest concern as grass species produce stems and tend to mature sooner than alfalfa. So, harvest should generally be timed to the grass rather than the alfalfa but if delayed by rain the higher fiber digestibility of reduced lignin alfalfa will benefit final forage quality. Grasses tend to stay vegetative on later cuttings, so the maturity of the alfalfa would determine the cutting timeline and reduced lignin alfalfa would have an even wider harvest window.