
Alforex Seeds™
Hi-Gest® ALFALFA
The First Low Lignin Alfalfa on the Market
• Higher Digestibility and Intake for More Milk/Beef
• Delivered in Elite Genetics
• Better Quality Without Changing Harvest Practices
• Harvest Flexibility
Breeding, Technology & Management Overview

Breeding Overview

Hi-Gest® ALFALFA

Alforex Seeds has chosen Hi-Gest® as the name for its innovative class of low lignin forages, focused on improving digestibility and performance in livestock rations. These Hi-Gest forages were developed through conventional plant breeding to improve fiber digestibility and forage quality through a significant reduction in whole plant lignin. This Hi-Gest class of low lignin forages began with the introduction of Hi-Gest BMR hybrid sudangrass, followed by BMR hybrid sorghum x sudan and BMR hybrid forage sorghum.

The most recent additions to this lineup are Hi-Gest alfalfa varieties which were selected for low lignin content in the plant tissue. This genetic reduction in lignin results in improved fiber digestibility. Animal nutritionists indicate this breakthrough of Hi-Gest alfalfa varieties will increase animal intake which in turn will increase milk or meat production.

Breeding History

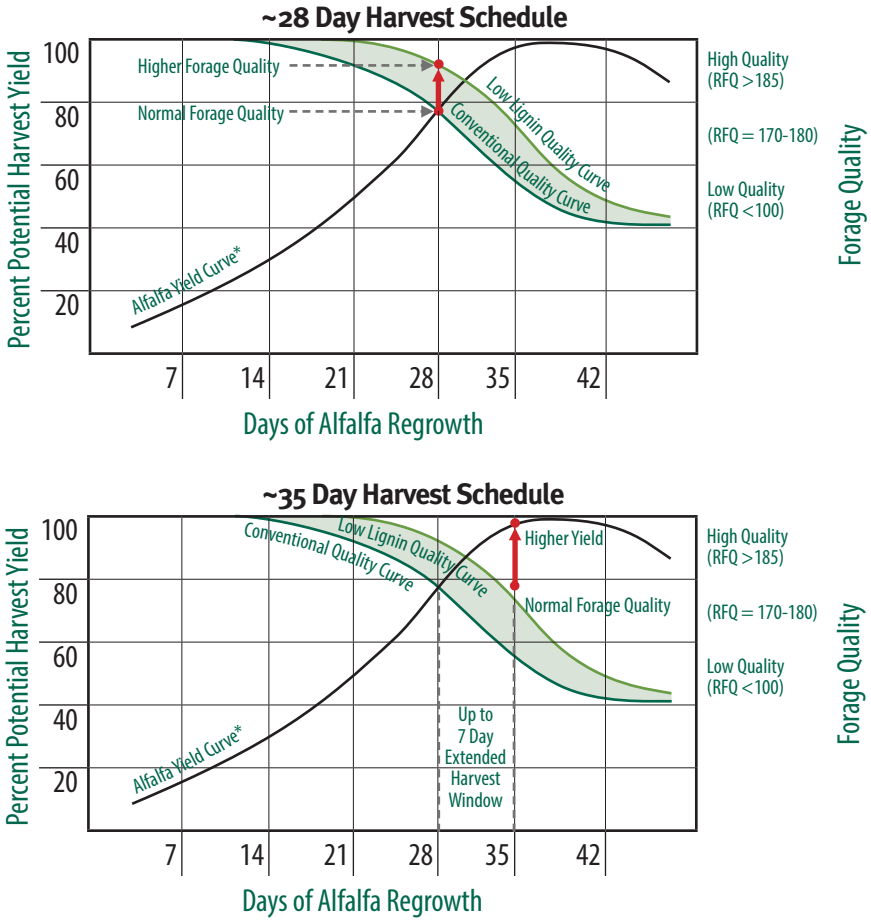
The breeding of Hi-Gest low lignin alfalfas began several years ago when the Alforex research team surveyed its alfalfa germplasm collection for the various genetic factors that contribute to forage quality. It was determined that there was enough natural genetic variability within the pool to allow significant genetic improvement to be made. Using conventional breeding techniques and screening hundreds of thousands of plants, our breeders began the long process of selecting for elite parental material that expressed both strong agronomic traits and low lignin content. Following several cycles of selection, elite parental plants were then combined to develop high yielding alfalfa varieties displaying the low lignin trait. After years of testing, Alforex Seeds is now ready to release the industry's first low lignin alfalfa varieties.

The Alforex Seeds low lignin alfalfa varieties were developed using conventional plant breeding and are therefore classified as non-transgenic.

Available for 2015 Planting

All low lignin alfalfa varieties will be designated and marketed under the Hi-Gest designation. The first two alfalfas released by Alforex Seeds for the low lignin trait are Hi-Gest® 360, a widely adapted dormant variety and Hi-Gest® 660, a semi-dormant variety. The Hi-Gest 360 is a fall dormancy 3 and Hi-Gest 660 is a fall dormancy 6. Patents are pending for both varieties.

Low Lignin Vs. Conventional Alfalfa Yield and Quality Compared Over Time



The charts above illustrate the inverse relationship between increasing yield and decreasing forage quality from increasing lignin content in growing and maturing alfalfa. The conventional and low lignin quality curves illustrate the difference in forage quality at the ~28 day/one-tenth bloom and ~35 day/full bloom stages and the advantage of having an alfalfa with a 7-10% lignin reduction in the field.

* The same yield curve expected for conventional and low lignin varieties.

Lignin and Forage Quality

Lignin is defined as a complex organic compound that binds cellulose fibers and hardens and strengthens the cell walls of plants. This process accelerates as plants mature and gives structural support to the plants as they become taller. This lignification is most pronounced in older stems of mature plants and least pronounced in young developing growth. The increase in lignin in mature plant tissue negatively affects forage quality and interferes with animal digestion rates.

Alfalfa forage with reduced lignin will digest faster in the animal's rumen and as a result, animal intake will increase. This increase in the rate of digestion will result in increased milk or beef production.

Lignin in Growing Alfalfa

Alfalfa forage yield is generally highest at full maturity (full bloom); however, forage quality decreases with plant maturity. This reduction in forage quality is generally attributed to the increase in lignin content that accumulates as plants mature. As lignin increases in the plant tissues, forage quality decreases proportionally. Historically, producers attempted to optimize these negatively correlated traits of yield versus forage quality by using a harvest date/maturity of late bud to one tenth bloom to optimize both yield and forage quality. This early harvest minimizes the negative effect of lignin build-up without overly sacrificing dry matter yield or persistence.

Advantage in the Ration

When Hi-Gest low lignin alfalfa varieties are harvested on a typical cutting schedule (~28 to 30 days and one-tenth bloom), the level of lignin will be lower than that of conventional varieties at a similar stage. Though forage quality and digestibility decrease at each growth stage through full maturity or full bloom, Hi-Gest's low lignin characteristic reduces the impact of that change.

When using the Milk 2013 Program** to calculate the change by increasing 1 percent in neutral detergent fiber digestibility (NDFD), you will find the Relative Forage Quality (RFQ) increases between 2 and 3%, milk per ton fed increases by 21 pounds and milk per acre increases by 167 pounds. Research from Michigan State University has shown for each one percentage unit increase in forage neutral detergent fiber (NDF) digestibility, there is an increase of +0.51 pounds of milk yield. The Hi-Gest varieties are estimated to have a 7-10% lignin reduction depending upon harvest maturity, management practices and the variety.

Lodging Concerns

The most common concern about low lignin varieties is lodging. During the development of the Hi-Gest trait, our breeders carefully monitored the plant lignin content to ensure the amount of lignin reduction was not at a level that adversely affected standability, but reduced enough to still provide a significant increase in digestibility. As a result of the breeding efforts, the lodging tolerance of the Hi-Gest varieties is comparable to synthetic alfalfas. Advanced testing of the Hi-Gest varieties has shown no indication that the lignin reduction levels of the Hi-Gest varieties increase lodging when compared to other synthetic varieties.

Measuring Low Lignin

The impact of forage quality on animal performance is generally expressed in terms of palatability, intake, digestibility, nutrient content and anti-quality factors. Low lignin levels affect several of these quality factors directly and/or indirectly.

Low lignin is a reduction in whole plant lignin estimated by Acid Detergent Lignin (%ADL) when comparing Hi-Gest Alfalfa varieties to non-selected varieties. Near Infrared Reflectance (NIR) Spectroscopy as well as wet chemistry can be used to measure this difference or reduction in lignin content.

While the difference between Hi-Gest alfalfa and its conventionally-bred synthetic alfalfa counterparts may not be obvious in the field, the benefits may be seen in improved animal performance.

** http://www.uwex.edu/ces/forage/pubs/milk2000.htm.

Management Overview

Harvest Options

The grower has four general harvest options available when growing alfalfas with this new technology:

1) Produce dairy quality haylage or hay by taking advantage of the genetic reduction of lignin in the plant, and harvesting fields on a normal ~ 28 day cutting schedule to produce a high quality forage that has increased fiber digestibility and higher animal intake.

2) Producers can extend the peak harvest date by up to 7 days to ~35 days versus 28 days. This option utilizes the low lignin trait as a means of increasing yield without sacrificing forage quality. Hi-Gest plant tissue has a lower initial lignin content as it matures and therefore can grow up to an additional 7 days before its lignin content equals that of synthetic varieties cut at 28 days or one tenth bloom.

3) Producers can use the low lignin trait if a field is ready to be cut but rainy weather is forecast by delaying harvest up to 7 days to avoid rained-on forage. This flexibility at harvest time helps the producer minimize the effect of bad weather and reduced forage quality. Synthetic varieties harvested at the later date would have lower forage quality due to its maturity and higher lignin content.

4) Producers can use the low lignin trait for market flexibility. For example, if regional hay supplies are short and the alfalfa price per ton is high, the producer can delay harvest to increase yield without the risk of producing lower quality forage. Conversely, if dairy quality hay is selling at a premium, growers can harvest some cuts using a normal cutting schedule (~28 days or one tenth bloom) and market those higher quality cuts to the dairy market.

Agronomic Traits

Great care was taken in the development of the Hi-Gest varieties to ensure that each maintained all the desirable agronomic traits that growers expect in an elite alfalfa variety. High levels of winter survival were maintained, along with disease and pest resistance, and there has been no indication that these Hi-Gest varieties have a yield drag that is often associated with new traits.

Management Practices

Alfalfa growers will not need to change their management practices to benefit from the use of Hi-Gest alfalfa for haylage or hay. However, as with all alfalfa varieties, growers are strongly advised to use recognized best management practices for their area to maximize seasonal yield, forage quality and stand life.

Field Appearance

From a distance, a field of Hi-Gest alfalfa will look very much the same as a synthetic alfalfa field. However, standing in a Hi-Gest alfalfa field, the grower will see a leafy, dense canopy with a higher concentration of leaves in the lower plant canopy than most other synthetic varieties. Foliage color is medium-dark green, with fine to medium stems.

Persistence

Winter survival is equal to synthetic varieties of similar fall dormancies. However, stand life may be enhanced if managed under a cut system where the extended harvest window is utilized.

Summary

The new Hi-Gest alfalfa varieties are elite top of the line alfalfa varieties which now have the added advantage of the low lignin trait. Available for on-farm planting during the 2015 planting season.

Alforex Seeds™
Alfalfa and Forage Excellence
38001 County Road 27 • Woodland, CA 95695
(800) 824-8585 • alforexseeds.com

Dow AgroSciences — *Solutions for the Growing World*