

Comparison of Commercially Available Novel-Endophyte Tall Fescue Forage Varieties

Kendra Phipps¹, Charlotte Talbott², Madeline Newsome², Deidre Harmon³, and Matt Poore⁴

¹Assistant Extension Agent, Livestock and Forage Crops, NCSU

²Graduate Students in the Dept. of Animal Sci., NCSU

³Mountain Livestock Specialist and Assistant Extension Professor of Animal Science, NCSU

⁴Extension Specialist and Professor of Animal Science, NCSU

History and Importance of Tall Fescue as a Forage Crop

Tall fescue is one of the most common forage species in the Eastern USA. First recognized on a Kentucky farm owned by William Suiter, it was initially known as “Suiter’s grass.” In 1931, Dr. E.N. Fergus visited Mr. Suiter to look at the grass. He recognized its potential, so he took seeds to the University of Kentucky where he began growing it in test plots. William Johnstone encouraged Dr. Fergus to release this variety of tall fescue, Kentucky-31 (KY-31), to the public in 1943. Kentucky-31 tall fescue quickly became the forage of choice across the mid-south due to its superior drought tolerance, ability to withstand heavy grazing, and high yield capacity.

This improved agronomic performance is the result of a fungal endophyte living between the cells of the plant. The wild type endophyte found in KY-31 produces toxins called ergot alkaloids and other groups of alkaloids that are beneficial to the plant, but that can cause detrimental effects leading to loss of production when infected plants are consumed by animals. Health and reproductive effects include decreased intake, decreased weight gains and milk production, abortion, rough hair coat, increased heat sensitivity and severe lameness. These symptoms are

DRAFT

collectively called “fescue toxicosis syndrome”, and they result in a loss of approximately one billion dollars in the US cattle industry each year. Decreased performance also reduces income in other farm animal species, including small ruminants and equines.

In the 1980s and 1990s, endophyte-free (EF) varieties of tall fescue were released as a solution to fescue toxicosis. However, absence of the endophyte caused substantially reduced seedling vigor and plant persistence, greatly reducing the agronomic performance of endophyte-free varieties of tall fescue as compared to KY-31.

Naturally occurring, non-toxic “novel” endophytes had been previously identified in perennial ryegrass, which led to identification of novel endophytes in tall fescue. These novel endophytes were isolated and transferred into improved tall fescue varieties, creating what is now commercially available as novel endophyte (NE) tall fescue (Phillips, 2012). It is important to emphasize that NE tall fescue is not the same as endophyte free tall fescue, as it has increased persistence due to endophyte presence. NE tall fescue retains the agronomic benefits of KY-31 fescue without the toxicity to animals (Roberts et al., 2002; Nihsen et al., 2004). While these breakthroughs have been available to producers for over 20 years, producer adoption has remained low. The cost of renovating pastures, uncertainty concerning NE tall fescue stand persistence, and confusion surrounding the available varieties may be reasons why farmer implementation has been slow. In order to provide streamlined information about available NE tall fescue varieties, North Carolina State University, The Alliance for Grassland Renewal, and cooperating seed companies have created this publication to provide a guide to assist in identifying the best NE tall fescue variety for each unique production situation.

Planning for Renovation

Renovation should begin by controlling seedheads of existing cool-season perennials, such as KY-31, the spring prior to renovation. This reduces viable seed on the land, preventing development of new KY-31 seedlings along with the newly established Novel Endophyte Tall Fescue seedlings. Implementing either a spray-smother-spray or spray-wait-spray land management plan will further ensure that competition is eliminated, by eliminating seedlings and missed places (skips in spray pattern) twice before establishment. Achieving a successful renovation requires planning and attention to details, but in general it is more successful than establishment of many other forage types.

Choosing and Purchasing Seed

Before shopping for seed, understand that there are three distinct types of tall fescue available: endophyte-infected KY-31, endophyte-free (contains no endophyte at all), and novel endophyte infected (tall fescue variety matched with a proven novel endophyte). For the best combination of agronomic and animal performance attributes, NE tall fescue will usually be the best choice across the entire fescue belt. EF tall fescue is recommended only for situations not requiring a long-lasting pure stand of tall fescue, such as in multi-species forage mixtures, in short crop rotations or in the most temperate parts of the Fescue Belt. Alternatively, KY-31 is generally not recommended except for situations where a very stress tolerant stand is needed, and high animal performance is not an important goal. Endophyte-free varieties generally will not tolerate conditions such as

DRAFT

drought, constant overgrazing, or insect infestation because they do not contain an endophyte. Alternatively, novel endophyte varieties perform better than endophyte free varieties under such conditions, but are more expensive to establish than KY-31, therefore making it counterintuitive to establish them where these issues are expected and will not be mitigated.

Novel endophyte tall fescue seed is significantly more expensive than the other varieties of forage-type tall fescue; however, economic calculations have shown that the initial input cost can be offset by gained revenue resulting from improved animal performance as compared to that of KY-31. Choosing the best variety of novel-endophyte tall fescue involves considering many factors, such as region and management style. The two soft leaf types, BarOptima with E34 and Tower Protek, can be expected to support slightly higher intake and animal performance (important for dairy and stocker cattle), but these varieties require increased attention to management and preferential grazing may lead to overgrazing. Traditional leaf novel endophyte tall fescue varieties still support high levels of performance and are generally less likely to be overgrazed than soft leaf counterparts.

It is critical to begin planning for renovation to novel endophyte tall fescue varieties early for numerous reasons, but an important one being that NE tall fescue seed is not stocked early in the season in quantities comparable to KY-31. NE tall fescue seed is generally not harvested until July of the establishment year. After seed is harvested, it is sampled and submitted for testing under the quality control standards of the Alliance for Grassland Renewal. Seed lots must contain at least 70% viable endophyte and no more than 5% “off type/wild type endophytes” (KY31 or turf-type varieties containing high ergot alkaloids) to be labeled with an Alliance for Grassland Renewal

DRAFT

seal. The timing of seed harvest and the subsequent quality control process mean seed becomes available very close to establishment season. Because of this, planning for and placing seed orders ahead of time is recommended. After being received, seed should be stored in a cool, dry place until to planting. It may difficult or impossible to purchase novel endophyte tall fescue seed without pre-ordering, as many dealers do not generally stock large quantities; however, seed supply stores commonly have some endophyte-free varieties (for example, KY-32) and KY-31 in stock. It is important to be aware of the differences between endophyte-free, novel-endophyte, and wild-type endophyte infected tall fescue varieties to prevent receiving incorrect information when purchasing seed. The Alliance for Grassland Renewal quality seal will always be present on proven novel-endophyte forage type tall fescue seed.

Establishment and Management

Establishment and management guidance is essentially the same for all novel endophyte varieties. The recommended seeding rate ranges from 13 to 25 lbs./acre, so check the state specific planting guides. For this reason, seed can be drilled at a depth of ¼” to no deeper than ½” or broadcast onto a prepared seedbed and followed with a cultipacker. Seeding too deep is the most common cause of establishment failure. It is best to consult specific state planting guides for recommended planting dates, with most within the fescue belt being in early autumn. Before planting, amend soil pH to 6.0-6.5 and apply phosphorus and potassium according to soil tests. Starter nitrogen should be applied at a rate of 25 to 35 lbs./acre.

DRAFT

General management recommendations for new novel fescue stands are applicable to all varieties. Do not graze or hay new stands until they are 6-8” tall, being sure to leave 3-4” of residual after grazing or haying. Rest newly established pastures during the summer season.

Comparison of Tall Fescue Varieties and Traits

The following table compares available novel endophyte varieties, a common endophyte-free variety, and KY-31. Included traits for comparison include time to maturity and leaf type. Time to maturity is presented relative to KY-31 and is adapted from the University of Kentucky’s variety trial results, cited below. Leaf type is classified as either traditional or soft, with most tall fescue varieties being classified as having a “traditional” leaf type, which is how the blades of KY-31 are classified. Tower with Protek and BarOptima Plus E34 are considered to have a soft leaf type. Currently, there is no accepted standard method among agronomists of assessing and assigning a leaf type, but there are specific visual and tactile differences, although these are subjective. In general, traditional leaf feels somewhat coarse and it has a sharp serrated leaf edge. Soft leaf has a softer feel and the leaf edge is not as sharp. Livestock find the soft leaf varieties more palatable, so they will tend to eat more, and this means they are more likely to overgraze. While soft leaf types may lead to better animal performance, the importance of management to prevent overgrazing cannot be overemphasized. Seedling vigor, which is the ability of seedlings to survive during the plant’s early development is also a very important trait considered during variety development.

DRAFT

Seedling vigor, yield, and animal performance have not been different among varieties during most trials, other than the obvious KY-31, so they are not included columns in the table below. Stand life and persistence are not included in the table below as there is currently not enough long-term data to provide an estimate, although available data indicates that endophyte-free varieties do not persist as well as, and have shorter stand life than KY-31 and novel endophyte varieties. Ergot alkaloid concentrations among novel and endophyte free varieties are generally negligible, with the exception of BarOptima plus E34. Typically, the ergot alkaloid concentrations produced by BarOptima plus E34 are well below what is considered toxic, but it is important to note that large variability has been noted between years and within seasons. Although these levels are highly variable, they are typically negligible in relation to animal performance, however, special caution should be taken for pregnant mares (Dillard et al., 2019).

Table 1. Comparison of Tall Fescue Varieties and Traits

Variety	Company	Endophyte Technology	Endophyte Type	Leaf Type	Time to Maturity	Target Market Area
Lacefield MaxQ II	Pennington	MaxQ II	Novel	Traditional	Medium	Northern Fescue Belt
Texoma MaxQ II	Pennington	MaxQ II	Novel	Traditional	Early	Western Fescue Belt
Jesup MaxQ II	Pennington	MaxQ II	Novel	Traditional	Early	Eastern Fescue Belt

DRAFT

Jesup MaxQ	Pennington	MaxQ	Novel	Traditional	Early	Eastern Fescue Belt
Tower Protek	DLF Pickseed	Protek	Novel	Soft	Late	Northern Fescue Belt
BarOptima Plus E34	Barenbrug	E34	Novel	Soft	Late	Fescue Belt
Martin II Protek	DLF Pickseed	Protek	Novel	Traditional	Early/ Medium	Fescue Belt
Estancia ArkShield	Mtn. View Seeds	ArkShield	Novel	Traditional	Medium	Fescue Belt
Cajun II	Smith Seed Services	None	None (Endophyte Free)	Traditional	Early	Fescue Belt
KY-31	None	Wildtype (Toxic)	Wildtype (Toxic)	Traditional	Medium	Fescue Belt

(Spitaleri et al., 2002; Olson et al., 2019)

History and description of current Novel Endophyte Tall Fescue varieties

Pennington Varieties

Pennington Seed currently offers 4 varieties of novel endophyte tall fescue. None of these varieties are commercially available as endophyte-free. All are traditional leaf varieties, with the latest three utilizing the same endophyte technology (AR584), referred to as MaxQII. The largest difference between varieties is their specified regions for adaptation. All are adapted to the fescue belt, with

DRAFT

Texoma having capabilities in the western-drier regions and even outside of the fescue belt and Lacefield being well suited for Kentucky and the surrounding area. Lacefield is also a late maturing variety. Jesup MaxQII is the current recommendation for the eastern fescue belt.

Jesup MaxQ

Jesup MaxQ was the first novel-endophyte fescue variety commercially available. The story of its development begins with Dr. Joe Bouton, who began work as a forage breeder at the University of Georgia in 1977. Around this time, work was being done to identify the cause of fescue toxicosis syndrome, and the staff at the USDA Richard B. Russell Center in Athens, GA proposed that fungal endophytes living in the plant were the cause. Researchers at Auburn University began fescue grazing studies and noticed that on some pastures, animal weight gains were nearly double that of others. These pastures had been planted with fescue seed from a previous year, and a combination of time and heat had killed the endophyte in this seed. Dr. Bouton created populations of fescue and selected for persistence, but these proved to be highly infected with the toxic endophyte. Endophyte-free populations were created of these varieties, but stands of these endophyte-free varieties did not persist in trials, further proving that the endophyte was connected to the exceptional agronomic performance of KY-31 tall fescue. Dr. Bouton began to search for a way to maintain the agronomic performance of the toxic populations, but not have the negative effects on animal performance.

Research was being done in New Zealand at that time to isolate strains of endophyte from around the world in both perennial ryegrass and tall fescue, which was being led by Dr. Garry Latch of AgResearch. Dr. Bouton met Dr. Latch at the International Grassland Council Meeting in France

DRAFT

in 1989 and began their collaborative effort of creating a non-toxic fescue that contained a novel endophyte. Using both of his developed fescue populations, Jesup and Georgia 5, Dr. Bouton conducted research to identify which variety would respond best to several different novel endophytes, and Jesup with AR542 endophyte was chosen. Grazing trials across several animal species, including cattle, sheep, and horses, were conducted to ensure that this novel endophyte did not have toxic effects. These trials proved that this novel endophyte allowed for the best of both worlds: agronomic persistence and no negative impacts on animal health and well-being. MaxQ Tall Fescue, as it would come to be marketed, was rigorously tested across several different environments to prove Jesup's ability to perform in many regions of the fescue belt. Because it was the first novel endophyte tall fescue variety, more is known about MaxQ than many varieties on the market now. Recently, Pennington has begun to replace Jesup MaxQ with Jesup MaxQII. Jesup MaxQII utilizes the same variety of fescue as Jesup MaxQ, but contains an improved, more resilient novel endophyte, AR584, known commercially as MaxQII.

Lacefield MaxQII

Dr. Tim Phillips began his career as a forage breeder at the University of Kentucky in 1992, where he inherited an old tall fescue variety trial. In the Spring of 1993, he selected plants from several endophyte free KY-31 genetic lines and began crossing these plants, selecting for excellent seedling vigor and later maturing plants than KY-31. At the time, tobacco was a large agricultural crop in Kentucky, with most farmers growing forage also producing tobacco, often delaying hay harvest until after setting all their tobacco. This delay resulted in lower quality hay, leading Dr. Phillips to select plants that were later maturing, which allows the forage to maintain its quality later in spring. In 2002, Dr. Phillips was beginning the process to release this variety, known at the

DRAFT

time as KYFA9301, as an endophyte-free variety, when he was approached by the New Zealand based company Ag Research about using one of their novel endophytes in the variety. The research process proceeded for 13 years after the addition of the novel endophyte, and nearly 22 years after the initial selection, KYFA9301 was released as Lacefield MaxQII, in 2015. Lacefield MaxQII, named for forage pioneer Dr. Garry Lacefield, became commercially available in 2018.

Texoma MaxQII

Dr. Andy Hopkins began work at the Noble Research Institute in April 1997 and immediately began developing a cool season perennial forage well suited for the Southern Great Plains. The Noble Research Institute had extremely old tall fescue pastures in Southern Oklahoma, and he began collecting seed from plants in high and dry areas of these pastures, which gives this variety the characteristic of being selected from an existing population, rather than being bred. This forage was evaluated for several years for grazing tolerance during periods of drought. The institute partnered with AgResearch to infect this variety with a novel endophyte, AR584, and extensive efforts were made to ensure that there was no toxic endophyte infection. Several grazing trials were performed at Noble Research Institute and at collaborating universities, including with lambs, cattle, and horses during periods of drought, and the variety proved persistent. The name Texoma MaxQII was chosen for this variety because of where it was developed, as well as its target market area.

DRAFT

Mountain View Seeds

Estancia with ArkShield

The development of Estancia with ArkShield® began as a fescue variety called HiMag at the University of Missouri and USDA-ARS in Idaho. The original goal was to produce a variety with low grass-tetany potential (because it contains higher magnesium than most tall fescue). The University of Arkansas, in cooperation with the University of Missouri, furthered research on HiMag to create ArkPlus novel-endophyte tall fescue. It was not marketed to reduce the risk of grass tetany but rather as a variety well adapted to the transition zone of the eastern half of the U.S. with an endophyte proven to aid plant persistence while lacking livestock toxins. ArkPlus was pulled from the market due to a patent dispute. Eventually, rights to produce and market this variety was obtained by Peak Plant Genetics and Mountain View Seeds in Oregon and is marketed under the brand name Estancia with ArkShield®. Estancia is marketed as a medium-maturing, high-yielding tall fescue with high seedling vigor, and with very good persistence under proper management. There is no endophyte-free version of this variety available. Much of the research data was produced in Arkansas and Missouri, but Estancia has also done well in many other locations in the eastern and southeastern U.S.

Smith Seed Services

Cajun II

Cajun II of Smith Seed Services is an endophyte-free variety of tall fescue and is included for comparison. It is included here as an example of many good endophyte-free tall fescue varieties

DRAFT

that perform well in the northern most areas of tall fescue adaptation and also are sometimes useful in multi-species mixtures or for short-term rotations (especially for hay production) within the entire tall fescue belt. Early research on the development of Cajun II began in the late 1980's in order to produce a non-toxic variety of fescue that was well adapted to the southern half of the transition zone (including NC, KY, TN, and SC). Wayne County, NC was the original testing site for Cajun II with supporting research taking place in Pennsylvania and Kentucky. The development was a decade-long process that selected traits for regional adaptation, winter hardiness, and pest resistance. Breeders started by looking at varieties that excelled in these traits, including Cajun, Martin, Mozark, and other hardy varieties like KY-31. Two types of tall fescue genetics, Mediterranean and continental, were crossed to make Cajun II. Mediterranean plants are summer dormant and continental varieties are summer active, making Cajun II suited to spring and summer performance.

Cajun II is generally recommended for hay production in mid-Atlantic states due to its hardiness, persistence, and low management input. During the time of development, there was a growing need for a variety other than toxic KY-31, and other available varieties had limited survivability in harsher climates. Early reports of other endophyte free varieties showed limited survivability (although there was often no yield difference), meaning they should not be recommended for continuous grazing. Cajun II showed equal survivability performance to novel endophyte varieties in three year clipping trials, making it an affordable option for rotational grazing conditions or hay production. However, it is not recommended for situations where a very long-lived monoculture stand is desired, or where overgrazing may occasionally occur. Cajun II is also recommended for hay production because it is earlier maturing, yielding more cuts of hay. While Cajun II is targeted

DRAFT

primarily for the mid-Atlantic states, it is also popular in MO, OK, NC, SC, TN, VA, KY, AK, North TX, North MS, North AL, North GA, and Canada. Establishment recommendations include terminating all KY-31 before planting or diluting KY-31 without completely killing it. Cajun II can be seeded into KY-31 with a stress/shock approach by holding off fertilization in the spring, heavily grazing during the summer, broadcasting Cajun II when KY-31 is grazed short, and then “hoofing-in” with cattle. Cajun II and orchardgrass work very well planted together.

DLF Pickseed Varieties

Protek

The company DLF Trifolium began in 1906 when a group of Danish seed growers formed a grass seed cooperative in Denmark which then began to expand into other countries. When the company’s expansion reached Australia and New Zealand, the company noticed the value of novel endophytes, which led to a group collaboration and the isolation of the Protek endophyte. This endophyte naturally existed in the wild and was found and brought back to be analyzed. The endophyte Protek first began in the United States with the isolations ISO 207 and ISO 647. These isolations were able to move forward in trials and research and were both introduced to a potential host: Martin II. After many trials and research studies, it was decided ISO 647 would be renamed Protek due to its performance and stable relationship with its host, while ISO 207 did not move forward in development. One of the most notable moments in the research of Protek was the discovery that Protek was safe, had a stable relationship with its host plant and it did not produce any ergot alkaloids.

DRAFT

Martin II Protek

Protek was inoculated into Martin II because of its genetics and compatibility. Research with Martin II Protek spread to the United States with animal safety trials that began in 2009 and ended in 2012. These trials were conducted with sheep and found there were no negative impacts on the animals' weight gain or health. Martin II Protek is a composite variety with broad genetics. It is traditional in terms of leaf type and growth and has an early to medium maturity relative to other varieties. Martin II Protek does well with producing a high quantity of forage, but when compared to Tower Protek, the quality has a lower ranking. Martin II Protek also has good fiber digestibility and is relatively preferred or well selected to be grazed by livestock. A fact worth mentioning is that there is also a variety sold by DLF Pickseed simply named "Martin II" which is endophyte free and does not contain Protek or an endophyte of any kind, so farmers wishing to plant need to make sure they have Martin II Protek if they seek a novel endophyte tall fescue.

Tower Protek

It is important to note the development of the endophyte Protek is the same for both Tower and Martin II with Protek, but unlike Martin II with Protek, which originated from the United States, Tower with Protek originated from France. Tower was developed from the Mozark, Martin and Cajun varieties and KY-31 derivatives. Tower with Protek is also considered to have a later maturity and a softer leaf than many other fescue varieties, although a method to test leaf type has not been established. This soft leaf variety was chosen to better the quality and digestibility of the fescue, but it must also be under closer management than some other varieties because animal preference for softer leaves can lead to overgrazing. Therefore, Tower Protek is more focused on

DRAFT

quality rather than quantity. Tower with Protek is commonly found in the Northern Fescue Belt, but may perform well farther south if soil, environment, and management conditions allow.

Barenbrug USA

BarOptima Plus E34

The development of BarOptima Plus E34 began in the 1990's in France as the demand for a novel endophyte tall fescue grew in the United States. The first successful line created from a novel endophyte and a selection from Barenbrug was named BE9301. As the project progressed, trials of what is now known as BarOptima Plus E34 began in the United States in the early to mid-2000s. After many years of trials and research, BarOptima Plus E34 was finally patented in January of 2010. The name for BarOptima was created by Devesh Singh who wanted to portray the superiority for germplasm and the endophyte to consumers. He wanted a name that would describe the multiple traits of the variety which were optimized, hence BarOptima. While the early stages of the process began in France, the credit for this variety of fescue must also be shared with a group of scientists in The Netherlands who performed the initial endophyte inoculation. While testing leaf type is subjective and there is not an established method to do so, BarOptima Plus E34 is considered to have a softer leaf than other fescue varieties. European breeders selected a softer leaf germplasm to increase both the palatability and the digestibility of the grass. While a softer leaf may lead to better digestibility, it may be preferred over other grasses making it more prone to overgrazing with lack of proper management. The target market for BarOptima Plus E34 is the

DRAFT

lower to mid transition zone, or the Fescue Belt. The Fescue Belt stretches from Kansas to North Carolina and from Pennsylvania to Georgia.

Summary

Novel Endophyte Tall Fescue is a productive and persistent grass plant for the transition zone of the USA where the soils and climate support tall fescue. Novel endophyte tall fescue supports a high level of animal performance comparable to endophyte-free tall fescue, while delivering the agronomic performance expected from toxic KY-31 tall fescue. The novel endophyte tall fescue varieties described here are subjected to quality control through the Alliance for Grassland Renewal which has set standards for marketing this technology. When creating a pasture renovation plan, select from one of the varieties described here and remember to look for the Alliance for Grassland Renewal label, which confirms the specific lot of seed passed stringent quality control test.

Literature Cited

- Dillard, S. L., S. R. Smith, and D. W. Hancock. 2019. Variability of Ergovaline and Total Ergot Alkaloid Expression among Endophytic Tall Fescue Cultivars. *Crop Science* 59(6):2866-2875.
- Nihsen, M. E., E. L. Piper, C. P. West, R. J. Crawford, T. M. Denard, Z. B. Johnson, C. A. Roberts, D. A. Spiers, and C. F. Rosenkrans Jr. 2004. Growth rate and physiology of steers grazing tall fescue inoculated with novel endophytes *Journal of Animal Science* 82:878-883.
- Olson, G. L., S. R. Smith, C. D. Teutsch, T. D. Phillips, and J. C. Henning. 2019. 2019 Tall Fescue and Bromegrass Report, University of Kentucky, Lexington, KY. PR-766.

DRAFT

Phillips, T. D. 2012. *New Tall Fescue Varieties for the Future*, University of Kentucky, Lexington, K. Y.

Roberts, C. A., D. A. Spiers, A. L. Karr, H. R. Benedict, D. A. Sleper, P. A. Eichens, C. P. West, E. L. Piper, and G. E. Rottinghaus. 2002. Use of rat model to evaluate tall fescue seed with introduced strains of *Neotyphodium coenophialum*. *Journal of Agricultural and Food Chemistry* 50:5742-5745.

Spitaleri, R. F., J. C. Henning, T. D. Phillips, G. D. Lacefield, and D. C. Ditsch. 2002. *2002 Tall Fescue Report*, University of Kentucky, Lexington, K.Y. PR-474.

DRAFT

Authors would like to acknowledge and thank the following for contributing to the publication:

Dr. Joe Bouton (Ret. University of Georgia, Noble Research Institute), Dr. Tim Phillips (University of Kentucky), Dr. Andrew Hopkins (Corteva Agrisciences), Jerome Magnuson (DLF Pickseed USA), Dr. Peter Ballerstedt (Barenbrug USA), Robin Lamp (Barenbrug USA), Dr. Chuck West (Texas Tech University), Jonathan Rupert (Smith Seed Services)

DRAFT

Heifers Grazing Novel Endophyte Tall Fescue stockpiled for winter grazing.



DRAFT

Heifers grazing Toxic Tall-Fescue (Left) and MaxQ Novel Endophyte (Jesup) Tall Fescue (Right)



The Alliance for Grassland Renewal label documents that the seed has been tested and meets the standards for infection rate with Viable Novel Endophyte.

